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Wilgus, William John

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AMERICAN SOCIETY
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CIVIL ENGINEERS

PHYSICAL VALUATION OF RAILROADS.

BY

WILLIAM J. WILGUS, M. Am. Soc. C. E.

WITH DISCUSSION BY

MESSRS. MAURICE G. PARSONS, J. FRANK ALDRICH,
J. SHIRLEY EATON, C. P. HOWARD, M. H. BRINKLEY,
ALBIN G. NICOLAYSEN, F. A. MOLITOR, HALBERT P. GILLETTE,
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P. H. NORCROSS, CHARLES RUFUS HARTE, F. W. GREEN,
R. S. McCORMICK, CHARLES CORNER, AND
WILLIAM J. WILGUS.

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AMERICAN SOCIETY OF CIVIL ENGINEERS
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Paper No. 1287

PHYSICAL VALUATION OF RAILROADS.*

By William J. Wilgus, M. Am. Soc. C. E.

With Discussion by Messrs. Maurice G. Parsons, J. Frank Aldrich, J. Shirley Eaton, C. P. Howard, M. H. Brinkley, Albin G. Nicolaysen, F. A. Molitor, Halbert P. Gillette, J. E. Willoughby, S. Whinery, F. Lavis, William W. Crehore, Alexander C. Humphreys, J. H. Gandolfo, T. Kennard Thomson, Charles S. Churchill, R. D. Coombs, Colin M. Ingersoll, Arthur M. Waitt, Stevenson Taylor, F. C. Hand, P. H. Norcross, Charles Rufus Harte, F. W. Green, R. S. McCormick, Charles Corner, and William J. Wilgus.

The Herculean task of valuing the railroads of the United States is of vital importance to the entire nation, whether viewed from the standpoint of rate regulation or its possible outcome, government ownership. The vastness of the interests involved and the effect that the result may have on social conditions, make imperative the adoption at the outset of underlying principles and methods which will appeal to the public and the Courts as being fair and equitable.

It is with the object of promoting a discussion that will be of aid to those burdened with the accomplishment of this task that the writer ventures to advance certain opinions which are the fruit of his experience in the valuation field.

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* Presented at the meeting of October 1st, 1913.

Basic Principles.

There are several ways of determining physical value, depending largely on the purpose for which the result is to be used.

Sale Value.—In taxation matters, the sale value method has been used, right of way and real estate being taken at their assessed valuation, and other items at their depreciated or second-hand value, without the inclusion of overhead and development costs.

In New Jersey this method was adopted in compliance with the general tax law of the State, the expert in charge of the valuation stating in his report as follows:

"Since the real estate and personal property are to be inventoried and appraised separately from the franchise, it seems manifest that it is our duty to consider all of the thousands of parts and items of the property owned by each of the several railroads, entirely apart from their value as considered in the composite whole cemented together by the charter or franchise."

In referring to the fixing of land values, he says:

"We have the right to assume, however, that since the several assessors are elected or selected by the taxpayers of their respective communities, they must have had sufficient experience in land values to entitle them to assess the property in their respective districts, and that, therefore, they are the best available source of information concerning the going price or 'true value' of the land in their districts; and, since the several taxing districts are content to accept the opinions of these assessors as to the 'true value' of the property of individuals, corporations (excepting railroad corporations) and firms, we should give considerable weight to the opinions of the several local assessors when considering the 'true value' of land."

Also:

"No per cent. has been added to the value of lands in excess of the value in exchange for money, as near as such value can be determined by the exchange price of lands adjoining the lands of the railroad in each particular taxing district, and at each particular point where such lands adjoin railroad lands."

While the New Jersey procedure was proper under the conditions there prevailing, it yielded results entirely at variance with those obtained in other States where different theories have guided the appraisals.

Certainly, the sales value principle of treating the component parts of a property as uncorrelated items, at prices that they would bring if thrown on the market, is not applicable to the ascertainment of the full value of the tangible property of railroads as going concerns.

Original Cost to Date.—In the Act of Congress that prescribes the alternative methods under which the Interstate Commerce Commission is to proceed, Original Cost to Date is named, in which the actual cost of property, as reflected on the books and records of the companies, is to be taken.

With rare exceptions, it is extremely doubtful that the books and records of the railroads of the United States will be found to be dependable for the purpose of ascertaining present-day fair values. Only in recent years have cost accounts been kept in a uniform and complete manner, and even then the almost universal tendency has been to understate charges to construction, and to additions and betterments. This is particularly true on systems that are the product of gradual expansion over terms of many years. Interest during the period of construction, organization and administrative expenses, supervision, freight charges, and the use of equipment on extensions of main line and branches, in many, if not the majority of, instances, have been largely or entirely absorbed in the running expenditures of the parent company, and are not reflected in the book costs. On the older lines the accounts of many of the constituent roads have been lost or are incomplete. Additions and betterments have been charged to operating expenses. Roads have been absorbed through foreclosure proceedings, and the cost has been entered on the books at figures much less than their original cost. In fact, all that can be said of the surviving books of the older railroad systems is that they show merely such portion of the original cost to date as is there recorded, and that, therefore, they are not proper for use in physical valuations, except in so far as they may be of aid in casting a side light on estimated costs of reproduction as of the present time. Moreover, the loss of old records on many roads, and incompleteness of records on others, would necessitate frequent departures from the general rule, with resulting inconsistencies and injustice.

Cost of Reproduction New.—The second of the alternative methods prescribed in the Act of Congress is Cost of Reproduction New. Under this theory of valuation, as generally construed, the configuration of the ground surface and other natural topographical conditions along the line are assumed to be restored and be as they were before the railroad was constructed, but in all other respects the existing environment is taken as of to-day.

In determining quantities and values under this method it would seem essential that, as far as possible, the procedure should be duplicated that experience has shown would have to be followed, step by step, in the creation of a going railroad. Mere inventorying of the innumerable component items and the placing of a price on each will not give the cost of reproduction, because the intimate relation that the parts bear to each other and the cost of their assemblage into a connected whole are thereby ignored.

The impression prevails that the building of a railroad begins with the breaking of ground and ends with the driving of the last spike. The fact is that there are three well-defined and equally important stages that precede the successful completion of a solvent enterprise, the first and last of which are given but little weight in the usual estimating of cost.

First there is initiation. The plan has inception in the minds of men who are fitted by experience, acquaintanceship, resourcefulness, courage, and tact, to give it life and sustain it through many vicissitudes to final issue. Reconnoissances, preliminary surveys, and estimates of cost, revenue, and profits, are needed to demonstrate its feasibility. Tentative agreements are essential for the features that must be secured before publicity. Arrangements must be concluded for financing the project through underwritings or by sales of securities on a commission basis. Capable men must be selected for the administrative and engineering staffs. All this requires much time, often years, and considerable expenditures which the Interstate Commerce Commission has authorized as chargeable under its classification of "47, Interest and Commissions" and "48, Other Expenditures."

Next comes the constructive stage. This embraces final location, investigation of subsurface conditions, and surveys; the preparation of maps, plans, specifications, and estimates; the purchase and condemnation of rights of way and real estate; negotiations with other railroads for trackage and crossings, and with municipalities and towns for franchises and other privileges; the requesting of bids and the awarding of contracts; and then active construction by contract and company forces.

The acquisition of land and of rights from others is a slow and tedious process, fraught with delays and expensive litigation, and it is rarely safe to proceed with actual construction on important work until this step is concluded.

Construction proper necessarily would not be started simultaneously on all portions of a large system. The main stem would require first attention, followed soon by the important terminals, next the principal branches, then the lesser ones, and lastly the minor branches and spurs.

Expeditious construction of a great railroad system through populous communities does not admit of the awarding of small contracts, as is usual on minor extensions of a "going" railroad. Responsible contractors of wide experience, with followings of sub-contractors, must be attracted by the prospect of work of magnitude at remunerative prices.

Lastly is the educational and development stage, when the line is opened to traffic. Competent forces must be selected, organized, and trained to maintain and operate tracks, structures, rolling stock, and floating equipment. Errors of design and construction, as developed by operation, must be rectified. Equipment in consignments must be received from the manufacturer, "broken in," and assigned to varying duties. Traffic must be induced, economies studied, experiments tried, and the public brought to an appreciation of the new facilities. Stated differently, all parts of the new creation must be co-ordinated and thoroughly trained in their new duties before it is possible to handle successfully a great volume of traffic. This period of education, adjustment, and development, during which the earnings from operation would increase from nothing at the commencement to the full amount at the end of the period, varies, of course, with the nature of the country and traffic. Under the most favorable auspices, it usually lasts for several years.

It is evident that the mere inventorying of the items of a railroad as parts of an inert whole will not give due weight to the processes that experience has shown are essential to the creation *de novo* of a vitalized homogeneous system of transportation, equipped, manned, and trained for the same character of service that it now performs. The problem should be approached in much the same spirit as in the actual organizing, building, and launching of a new railroad.

Cost of Reproduction, Less Depreciation.—The remaining method mentioned in the Act is Cost of Reproduction, Less Depreciation. For rate-making purposes it does not seem to the writer that the physical depreciation should be deducted from the cost of reproduction new. Both law and practice have determined that all expenditures for renewals and repairs should be charged to working expenses, and not to capital; or, stated differently, normal depreciation is not to be treated as a wastage of capital, but as an element in the cost of operation that is covered by the rate.

That any other course would be improper and even illogical is at once apparent when it is realized that in any subsequent reappraisal, say a year hence, the inclusion therein at full value of a renewed item that appears in the appraisal at its depreciated value, practically would amount to the capitalizing of a renewal expenditure that had been charged to income.

In fact, the Act, in requiring that valuations shall be revised from time to time as improvements or other changes are made, in effect prohibits the deduction of depreciation, as otherwise the constant addition of amounts expended in the replacement or renewal of items that had been included in the valuation at their depreciated price, would be a violation of the rule of the Interstate Commerce Commission that operating expenses should not be charged to capital.

For instance, expensive coal pockets which will cost, say, $600 000 to renew, may be worth a nominal sum in their present-day run-down condition. The adoption of a depreciated figure would mean that when the structure is rebuilt, say, next year, $600 000 would be added to the valuation, although correct accounting would demand that the entire cost should be charged to operating expenses.

The conclusion seems warranted that, for rate-making purposes, depreciation should not be deducted from the cost of reproduction. It is plainly a liability of the stockholders, partly offset by any reserves that may have been established for that purpose, and should be given due weight in determining a railroad company's net profit and loss account. Of course, in the case of Government acquisition, this feature would require due attention, for the reason that the purchaser would be assuming the stockholders' burden of future restoration of depreciated items.

Summary of Basic Principles.—If the foregoing reasoning is sound, it is evident that the selection of the underlying basic principle must be guided by the purpose for which the valuation is made.

The sale-value method, while used in certain instances where the general taxation laws thus require, is inapplicable for rate-making and acquisition purposes because it does not take into account the features that mark the difference between an aggregation of dissociated parts and the same parts cemented together and pulsing with life as a going concern.

The original cost-to-date method is inadmissible, except as a side light on other methods, because the incompleteness and non-uniformity of past records are a bar to the making of accurate statements of full cost, and because the loss of such records on many roads makes impossible that universality of application that is essential to equity and fairness.

Cost of reproduction new, if estimated in such manner as to embrace all the steps that experience has shown are needed for the creation of a living, self-supporting organism, may be considered as a fair measure of physical value in connection with rate regulation; but physical depreciation, being an element of waste chargeable to operating expenses and therefore a stockholders' liability, is not deductible except in cases where the burden of restoring the depreciation is transferred to a purchaser.

LAND VALUES.

Even though the reproductive principle is accepted, there are many who contend that land values should be entered in the estimate at their original cost, or at the current normal market price of neighboring lands, without any increase for severance and other damages, or for the excess that railroads are compelled to pay for right of way.

Original Cost.—The "original cost" measure of land values is believed to be unfair, for two reasons: It ignores the increment that is enjoyed by all other property owners through increase in the population and prosperity of the country; and it would lead to the inconsistency of low original values on lines unfortunate enough to have preserved their land records, and high costs on adjacent lines where the absence of records would make imperative the use of present-day values.

Current Normal Market Prices.—That current normal market prices are not a proper gauge of the cost of reproducing railroad lands is well known to all who have had experience in right-of-way matters. From a variety of causes, such as severance and other damages, plottage, and the psychological attitude of owners toward corporate purchasers, the prices paid by railroads are far in excess of normal neighboring values, in cities and towns the average factor ranging from 1½ to 2, and in the country from 2½ to 3½. To ignore this condition is unjust in theory, and in practice would result in confiscation of property where actual expenditures for right of way on recently built lines can be proven to have been many times the cost that would result from the use of fictitious "normal market prices."

Reproductive Prices.—The conclusion seems warranted that strict equity can be served only by the adoption of one standard of land values applicable alike to all roads, and that the fairest standard is reproductive cost, which, as its name implies, calls for the estimated cost of reproducing the lands in each locality at the present time, taking into consideration all the elements which are known to have a bearing on the purchase of railroad right of way and real estate, including costs of acquisition.

This method guarantees equal consideration to the older lines and to those more recently built, avoids the dangers of confiscatory action, and gives due consideration to the facts that are known to enter into the purchasing and condemnation of lands for railroad purposes.

Lands Held in Reserve.—Recognizing that the erection of manufactories and other buildings, the opening of new streets, the laying out of parks, and the making of other costly improvements in the neighborhood of railroads, as well as increases in the values of adjoining property, will make the future acquisition of lands for the expanding needs of common carriers difficult and expensive, if not impossible, it has been customary for railroads to exercise foresight in the purchase of surplus lands at crucial points. It seems that lands in good faith so held in reserve for future use, are necessary for the proper performance of the duties of the railroads as common carriers, and, therefore, should be included in the valuation.

INVENTORYING AND PRICING MEASURABLE ITEMS.

A physical examination of a railroad at once reveals a multitude of items which are patent to the eye and, therefore, may be termed "measurable items."

Interstate Commerce Commission Classification.—To estimate properly the cost of reproducing these items in place, as parts of a connected whole, it is exceedingly necessary that they shall be listed in such a manner that their relation to each other will be apparent; and this can be best done by adhering strictly to the classification of expenditures for road and equipment, as prescribed by the Interstate Commerce Commission. In fact, this procedure is imposed under the terms of the Act.

A number of valuations have generalized their treatment of the data embraced under the primary accounts of the Commission, with results that will not bear analysis. For this reason it is essential that every road item should be entered under its proper sub-primary account, exactly as would be done in the building of a new line. Bunching items together at lump prices will not accomplish this result.

Tentative Prices.—By inventorying all parts, with a view to their relation to each other during the process of construction, and by adhering strictly to the Interstate Commerce Commission classification, it is possible to determine in advance of the field work a list of tentative prices for all the items chargeable to each of the sub-primary accounts that actual experience has shown will be encountered.

As conditions on many railroads in various parts of the country differ widely, each locality requires special study in conjunction with such records of actual cost as may be available. Based on this study, a tentative price list may be adopted for the general information and guidance of the engineer in direct charge of each railroad subdivision. Such prices would be modified by him whenever local conditions made that course necessary, and in such cases his reasons for the modifications should be given for *visé* by the engineer in general charge.

In fixing tentative prices, due consideration should be given to many elements of cost which are of a temporary nature during construction and are not always apparent in after years, as, for instance, salaries and expenses in connection with the acquisition of lands; temporary trestles to facilitate track-laying in advance of the erection of bridge superstructures; preliminary surfacing of track for the preservation of rail from injury pending final ballasting; and transportation of men, tools, and material to points of distribution, the expenses of which are best incorporated in the unit prices rather than to attempt to segregate them under Interstate Commerce Commission Account 32.

Owing to wide fluctuations in the costs of labor and material, the practice of adopting unit prices that will be fair averages over a period of several years has been followed extensively. This is undoubtedly the proper course, with the exception of items that have shown a constant tendency in one direction, as in the cases of lumber, piling, ties, and many classes of labor. In the latter instances, it would seem that current instead of average prices should be adopted.

OVERHEAD COSTS.

(Exclusive of Interest During Construction.)

As already stated, the inventorying and pricing of measurable items by no means yield the full cost of reproducing a railroad.

The necessity of providing means for cementing together these items is recognized by the Interstate Commerce Commission through certain accounts in the classification of expenditures for road and equipment, viz.: 1—Engineering; 35—Earnings and Operating Expenses during Construction; and 43 to 48, inclusive, General Expenditures.

An estimate of the cost of a railroad also requires an allowance for contingencies, which the fallibility of the best of engineering forecasts has shown to be necessary to cover omissions, errors, and uncertainties.

In the aggregate, these overhead expenses constitute a large percentage of the total cost.

Engineering.—It should be borne in mind that Interstate Commerce Commission Account 1 calls for engineering expenses in connection with Road Items 4 to 31 only, and does not apply to Items 2—Right of Way and Station Grounds, and 3—Real Estate, nor to Items 37 to 42, inclusive, Equipment.

Contingencies.—Despite the utmost care in estimating, experience has shown that final costs are invariably far in excess of preliminary forecasts, unless a percentage is added to cover a multitude of contingencies that arise during the prosecution of work.

An honestly prepared estimate never over-states quantities, but, on the contrary, omits many which are overlooked or escape attention.

Claims are made by neighboring land owners, employees, contractors, and others that frequently involve lawsuits.

Condemnation proceedings result in awards for damages far in excess of usual anticipations.

Floods, wash-outs, and errors of employees cause added expense.

Delays are sure to arise that enhance costs, as, for instance, through strikes, court proceedings, and difficulties in securing labor and materials, and also through increased interest charges pending the time of final completion.

Finally, there is always the danger of rising markets for material and labor, and of a scarcity of high-grade contractors.

Of recent years there has been a growing appreciation of the necessity of adding for contingencies not less than from 15 to 20% to carefully prepared preliminary estimates of cost. The instances are many where enterprises have under-estimated their cash needs, through inadequate allowance for this feature, with disastrous financial results.

It has been said that the knowledge gained from the study of a completed railroad largely eliminates elements of uncertainty. This is true of such features as adequacy of waterways, miscellaneous items often forgotten or overlooked in a preliminary estimate, and, to some extent, nature of foundations and classification of excavation; but the largest elements of chance still remain, such as claims, delays, rising markets, scarcity of competent contractors, omissions, inflated land values and damages, complications in connection with the elimination of grade crossings, and the nature of foundations, of which, on the majority of the older roads, little authentic information now exists.

There are also the further items, usually unprovided for elsewhere, of cost of acquiring lands; the expense of organizing maintenance and operating forces pending the commencement of regular operation; and expenditures for engineering, inspection, and "breaking in" of rolling stock.

General Expenditures.—In the words of the Chairman of the Public Service Commission of New York in the Rochester, Corning, Elmira Traction Company decision:

"When the amount of the actual cost of the physical construction of the proposed road has been determined we are still far from having determined the amount of capitalization which should be allowed. There are many elements of cost attendant upon bringing into existence of a new railroad additional to the cost of mere physical construction. Some of these elements may be enumerated as follows: (1) expense of organization, (2) incorporation tax, (3) expense of obtaining a certificate of public convenience and necessity, (4) preliminary engineering expenses, (5) expense of procuring the authorization of issue of stock and bonds, (6) expense of marketing the securities, (7) discount upon the bonds provided they cannot be sold at par, (8) interest upon the bond issue during the period of construction and prior to the beginning of operations, (9) compensation of officers of the road during the construction period, (10) incidental expenses during construction period, (11) expense of obtaining local franchises and consents.

* * * * * * * *

"Another subject of great interest and importance is the compensation, if any, to which the promoters of the enterprise should be entitled for their services. Promotion has been so extensively abused and has been so universally used as a cover for abuses in capitalization that it has come to be regarded as a term of reproach and as a device to work schemes of robbery upon the investing public. No reason is apparent why this should necessarily be so. The honest services of a capable promoter are indispensable to the flotation of every comprehensive and far-reaching scheme of development in the railroad world, or elsewhere. A clear vision to see opportunities, ability to demonstrate them to others, and energy to push to completion works untried but of great moment, are indispensable to material development and should be fairly and even liberally rewarded by the public which receives the benefit of those works. Such rewards, however, should be put upon a clear basis of business principle, should be of sufficient magnitude to encourage rather than discourage enterprise, and should not be so great as to make exorbitant demand which is perpetual in its nature, upon the community to be served. They are to be treated simply as just payments for services performed for the corporation, which services are valuable and in many cases even indispensable. Such services should be paid for upon the basis of what they are fairly worth, having regard to all the circumstances of the case

"These observations are so elementary that further elaboration of the principle involved should not be necessary. * * *"

The Interstate Commerce Commission classification of expenditures for road and equipment provides for the charging of general expenditures to the following accounts:

43—Law Expenses;
44—Stationery and Printing;
45—Insurance;
46—Taxes;
47—Interest and Commissions;
48—Other Expenditures.

It has been usual in the valuation of public utilities to fix arbitrarily a percentage of the total cost to cover these items, but it seems possible to make an analysis of these charges and thereby reach a result that may be said to have a logical basis.

Law expenses, stationery and printing, and insurance may be estimated by taking the aggregate annual current expenses for these items on a given railroad and making a suitable allowance for the additional expense that would be probable under the conditions of construction, as compared with normal operation, for one-half the adopted total period of construction from the inception to the final completion of the enterprise.

Taxes during the constructive period may be taken at the current annual amount for one-half of the period extending from the date of commencement of right-of-way purchases to the time of commencement of operation.

Discount on bonds by many is not considered to be properly chargeable to cost of construction, on the theory that pure discount is equivalent to an adjustment of the interest rate to current market conditions. A banker's commission for the sale of securities, however, should be included. Payment for the services of those undertaking the sale of stocks and bonds seems to be just as legitimate and necessary as compensation for other services incident to the carrying out of the project.

"Other expenditures" may be obtained by taking the current annual cost of salaries and expenses of general officers and clerks for one-half of a period extending from the commencement of right-of-way purchases to the commencement of operation. In addition to this there would be the further payment properly due to those who, through their initiative, originality, ability, and assumption of responsibility of final success, would give life to the enterprise. The propriety of making this allowance is well expressed in the above-quoted opinion of the Chairman of the Public Service Commission of the State of New York.

INTEREST DURING CONSTRUCTION.

It is generally conceded that interest on money during construction is as much an element in arriving at the cost of the reproduction of a railroad as expenditures for any other purpose in achieving the same result. Payments for the use of money are in principle not different from payments for labor, or materials, or right of way.

During the process of construction of a new enterprise there is no fund on which the company can draw for interest payments, except interest-bearing borrowings supplemented by such net earnings as may result from operation during that time; and hence the capital raised must be sufficiently large to cover all items of cost, including interest upon itself, and "interest on the interest," up to the point of final completion of the road in running order.

Methods of Calculating Interest.—Although the propriety of including interest on money during construction as an element of cost is thus recognized, the tendency has been greatly to under-estimate the amount.

It has been customary to take the estimated cost at the adopted rate of interest for one-half of the assumed period of construction. This treatment is on the theory that the expenditures will increase in a constant ratio or straight line, from nothing at the beginning to the full amount at the end of the constructional period; that money advanced to the company is non-interest-bearing until actually disbursed; and that no interest is paid on the interest payments.

An analysis of the conditions that actually obtain in the building of a large railroad shows that the usual method of calculating interest charges yields a result very much lower than would actually occur in a reproduction of the system, for the following reasons:

1st.—Expenditures do not increase in a constant ratio. In the preliminary stage the rate of expenditures is small. Then there follows a marked rise because of heavy right-of-way payments, followed by a somewhat decreasing rate. Finally, the rate again increases by reason of large payments for equipment. The usual result is a much larger volume of expenditures in the early stages of the work than appears from the use of the straight-line method.

2d.—The securing of capital on a basis that will assure its delivery exactly as needed for disbursement during the progress of the work is not practicable. Stringency in the money market or other unforeseen contingencies make imperative the possession by the company of ample funds to bridge over temporary crises, even when the funds are supplied through banking houses of unquestioned strength. Either the entire amount must be taken at the time of financing, or the capital must be paid in annual installments in advance. In either case the unused surplus over current needs is loanable at rates materially less than those paid by the company, the effect of which is an addition to the burden of interest charges during construction.

3d.—Interest charges must be paid from the capital, which itself is interest-bearing, and therefore it is not proper that interest on the interest should be omitted from the calculation of this item of cost.

Summarizing, the ordinary method of calculating interest charges usually produces an amount that is too low, by reason of the failure to take into consideration the heavy right-of-way expenditures in the early stages of the work; by reason of the neglect to include interest on unused money awaiting active use; and by reason of the omission of interest on interest.

Rates of Interest.—The rate of interest paid on the money invested has been usually taken at 6%, on the theory that the enterprise would be financed one-half on bonds bearing 5% and one-half on stock entitled to 7%, both bringing par on the market. Many examples can be quoted to show that this rate is conservative.

The rate received on balances placed on time loans may be taken at from 4 to 6%, and on call loans at from 2 to 4 per cent.

Time of Construction.—The assumed periods of inception, right-of-way purchases, active construction, and traffic development should be based on conditions as found on the particular railroad under consideration. On a complicated system, the time required for the acquisition of right of way and for the construction of the more difficult lines should govern, and the assumed date of commencement of active work on the less important lines and branches should be advanced so that sufficient time only will remain for their completion when needed for the initial operation of the system as a whole. Industrial spurs as well as equipment may be assumed to be supplied during the final stage when traffic is being gradually induced. By treating the subject in this manner the building of the various sections and the delivery of equipment will be co-ordinated with a view to completion only as needed, and the undue expenditure of interest on inactive capital thereby will be avoided.

Graphical Analyses.—To assist in determining the lengths of the different stages, and in ascertaining aggregate capital requirements and net interest payments as the work is assumed to progress, graphical analyses will be found to make this important subject clear and conclusive.

Earnings During Construction.—Proceeding on the theory that the full current net operating income of a railroad will be realized at the end of the last stage of construction, it is, of course, proper that the capital invested should be credited with the net earnings enjoyed during that stage. These may be taken at the full current net earnings of the company for a length of time equivalent to one-half of the educational and development period, except on roads where losses instead of profits may be fairly estimated for the development period. In the latter instances it would seem proper to consider the net losses as legitimate charges to the cost of creating the enterprise.

WORKING CAPITAL.

That working capital is absolutely necessary for the proper running of a railroad is well shown in the following extract from the opinion of the Chairman of the Public Service Commission of New York, in the Rochester, Corning, Elmira Traction Company case:

> "In addition to the foregoing matters, there should be provided upon the commencement of operation a fair and reasonable amount of working capital. The operation of the company can be continued with far greater efficiency, more to the satisfaction of the public, and with better results to the stockholders, if it has at all times in its treasury a working capital sufficient and adequate to meet the requirements of the road. Experience has demonstrated this so many times that insistence upon it or elaborate demonstration of its truth is not required at this time."

Working capital represents money permanently non-productive except through earnings derived from the transportation of passengers and freight. It includes cash held in readiness for the prompt payment of pay-rolls and vouchers, money tied up in bills receivable, and money invested in "stock on hand." The average amount may be ascertained from a study of the annual report of the railroad company.

DEPRECIATION.

Depreciation, modified by the appreciation of those parts that improve with time, should be based on actual conditions and on suitability for continued use. As a rule, several types of depreciable and appreciable property will be found on a railroad.

Bridges, Buildings, etc.—Structures like bridges and buildings, fundamentally sound and good for an indefinite continuing life, may have their depreciation measured by the estimated expenditures required to put them in 100% condition. Generally speaking, obsolescence in such instances is believed to be too speculative for consideration.

Rails.—Certain items, like rails, are good for an indefinite continuing life, during the early stages of which there is a gradual diminishment of value followed for many years by fixed values. Rails usually pass through several stages before they are unfit for further use in track. First, they are utilized on the more important lines until their condition becomes such as to make them unfit for high-speed passenger service. Then they are transferred to lines of minor traffic, or to sidings and yards, where they may remain for an indefinite period. Manifestly, it is improper to attempt to measure their depreciation on an arbitrary mortality basis, as in some instances the character of the traffic may be such as to wear out the rail in one-half or one-third of the assumed ultimate life, and in other cases the traffic may be so light as to permit the retention of the rail in service for possibly twice the assumed ultimate life. Therefore the depreciation of the rail in each instance must be judged by its actual condition and the kind of traffic that it bears. Commercially considered, there are three classes of rail: new, relayer, and scrap. Between the first two there is a gradually decreasing range of value from the new to the relayer price, the difference between them being spreadable over the average period during which it may be assumed that the rail will be suitable for the higher classes of service. Further depreciation below relayer value will depend entirely on actual conditions as the material approaches the point where it is removable as scrap.

Ties and Timber Trestles.—In a number of cases experience has shown that a fairly definite life may be determined. Ties, for instance, from a study of the renewal records of each company, will be found to have an average life, and the average percentage of depreciation of all the ties in track will depend on the time of year when the observations are made. Timber trestles will be found to have average lives, depending on the kind of material of which they are constructed and their location and purpose. In some instances the trestle may be made as good as new by the replacement of a few of the more perishable parts of the structure, and in other cases an entire renewal will be required.

Between these limits, depreciation should be measured by the proportion of the total life of the structure that has expired.

Equipment and Machinery.—With rolling stock, floating equipment, and shop machinery and tools, obsolescence as well as decrepitude should be taken into account, as past experience has proven that there is a well-defined period of economical life beyond which continued use is wasteful or unproductive. In treating this class of depreciation, more than ordinary experience and judgment are required, because of the fact that on the character of up-keep is dependent the economical life of the item that is under consideration. Therefore it is rarely possible to adopt any fixed rule that will be applicable under all conditions.

Graduation and Ballast.—Embankments in the course of time undergo solidification following impact of rolling stock and the action of the elements. This seasoning results in appreciation that may be gauged by the estimated cost of obtaining practically the same desirable condition at the time of the construction of the road. This cost will depend on the availability of water for consolidating purposes, the nature and quantity of material, and the degree to which the act of solidification will interfere with the ordinary manner in which the embankments would be built.

Excavations on a new railroad are known to give much trouble from slides and filling up of ditches, entailing constant labor, often with the use of work trains, until the surfaces of the cuts adapt themselves to conditions, or, in other words, become seasoned. In the case of embankments it is possible to measure appreciation by the equivalent cost of compacting them artificially, but it is not so easy to fix definitely the value of appreciation in excavations; however, a close approximation may be made by estimating the cost of work train and other service for an assumed period of time, taking into account, of course, depths of cuts, their age, and the nature of the material.

Where slopes for fills and cuts in the course of time have become grassed or otherwise covered with vegetation which protects the surface, allowance for appreciation may be made on the basis of the cost of the adding of these items in the course of construction.

For a considerable period after tracks are first ballasted, more or less trouble and expense are involved in preserving line and surface, particularly during periods of wet and frost. This is due to the working of the ballast into the roadbed, the filling of interstices from beneath, and to the fact that the ties have not become solidly embedded in the ballast. As a consequence of these conditions, extra labor is required constantly, to readjust the track, and there is an absence of the smooth riding of trains which is so essential to fast passenger service and to the minimizing of repairs to track and equipment. As time goes on, the track is raised on new ballast, so as to maintain it at its original height, and the original ballast is pressed or settled downward into the roadbed, where it remains as a firm, semi-porous substratum or blanket to protect and sustain the overlying newer ballast. This newer ballast is the visible portion which appears above the top of the shoulders of the embankment and is usually measured and estimated as ballast. The older or concealed ballast is incorporated in the roadbed, and though it is not measured and estimated as such, its value is reflected in the appreciated worth of the part that is measured and estimated. Experiments have shown that a thickness of 24 in. beneath the bottom of the ties is necessary to distribute the weights of rolling stock properly, and therefore appreciation of ballast may be considered as being measured by the cost of the concealed portion to a maximum depth of 24 in. below the bottom of the tie, less the cost of the roadbed material thereby replaced. Of course, if ballast is dirty and requires cleaning, the approximate cost of forking it over or otherwise cleaning it may be deducted from the appreciation arrived at as above.

ORGANIZATION OF VALUATION CORPS.

With the general principles settled which are to govern the work, the organization of the valuation corps next commands attention. Viewing the problem in the same spirit that guides the actual creation of a going railroad, it is evident that the mental attitude of the leading members of the corps must be in harmony with the practices that obtain in the inception, construction, and initial operation of the enterprise. Consequently, they must be men of broad experience in their respective fields, capable of adjusting rules and prices to conditions as they find them in each particular instance. Mere inventorying, without the detail and constant supervision of experienced engineers, will produce results which will be easily attackable in court.

In a word, the problem is one that calls for a high order of engineering skill in both rank and file, so that the outcome may reflect all the processes which have a bearing on the final cost of a live railroad.

Valuation of Road Items.—Rather than subdivide the work under a number of engineers having charge of separate subjects, such as grading, bridging, and track, the writer believes that territorial divisions or districts should be established, each in charge of an engineer capable of viewing his assigned territory as a whole, and of personally passing on the value and condition of all items in the light of their relations to each other, except those on which he will require the advice of special experts. In addition, it may be said that territorial valuation has the merit of readily lending itself to the segregation of results so that they may be made available for a variety of purposes, as, for instance, in estimating the cost per ton of transporting commodities from various originating points to destination, and in verifying values used in various taxing districts.

Although engineers with experience and ability in handling the work as thus outlined could personally pass on the majority of the items entering into way and structures, there are several features requiring the attention of special experts.

These consist of right of way and real estate, interlocking and signals, and shop machinery and tools. In addition, the engineer in charge of each district will at times need advice on other specialties, as, for instance, heating, lighting, and power plants in shops and enginehouses, and important or unusual structures.

Valuation of Lands.—The right-of-way and real estate expert should be a man of wide experience in the purchase of land for railroad purposes, having also an intimate knowledge of railroad land values in the section in which he is located. He should be expected to ascertain the current basic values of neighboring lands as a means of measuring the value of the railroad properties, make inquiries of local real estate agents and others familiar with the subject, and, in finally fixing values, take into account the factor in each case that experience has taught should be used as a multiplier in connection with railroad purchases.

It is believed that this method of ascertaining the reproductive cost of right of way and real estate, through the central agency of one having this comprehensive knowledge of the values of land purchased and used for railroad purposes, will avoid the inconsistencies and errors which are common where the work is entrusted to a multitude of local men unversed in the broader aspects of the problem.

Valuation of Equipment.—Rolling stock and floating equipment, as defined by the Interstate Commerce Commission, should each be placed in charge of an engineer of standing in his specialty. Each locomotive, car, and boat need not be viewed personally by the appraiser, but a sufficient number of each class or type may be inspected to fix their value and condition.

Forms and Tables.—The adoption of forms on which observations are to be recorded and results compiled, is, of course, an important step in the work. The forms should be inter-connected in such a way that it will be easy to trace backward from compiled results to the parent underlying data, and they should avoid generalizations which cannot be substantiated by facts as recorded in detail on the ground.

Tables and diagrams are also of value in facilitating field and office calculation of quantities, and as a check on arithmetical work.

CONCLUSION.

In conclusion, it may be said that the cost of reproduction new appears to be the only measure of physical value that places all railroads on the same plane, and the only one that provides for the inclusion of every element of cost that enters into the creation of a going railroad. If properly applied, it will give due weight to the duplication of lands, under exactly the same conditions as are known to prevail in actual practice; it will provide for the inventorying and pricing of measurable items in such a manner as to recognize their correlation and the varying local conditions that surround them; it will recognize the propriety of adequate charges for overhead costs, including engineering, contingencies, general expenditures, and payments for the use of money during construction, all of which are so essential to the assemblage and endowing with life of the component parts of the system; it will take into consideration net gains or losses during the final or development stage of reproduction; and it will not forget that working capital is as necessary to the success of the enterprise as other capital charges. The fulfilling of these conditions calls for engineering skill and experience of the highest class, not alone in technical fields, but also in the broader domains of administration, finance, and operation.

A physical valuation thus embracing every item of cost that enters into the duplication of facilities in full running order, equipped, manned, and trained for the same character of service that they are now performing, may be said to include many of the intangible elements of going value which are so difficult, if not impossible, to measure in any other manner. There are, however, other elements of value, such as traffic productivity and operating effectiveness, that cannot be measured in this manner, and therefore are beyond the scope of this paper.

Whether or not physical depreciation should be deducted from the cost of reproduction new, may be said to depend on the purpose of the valuation. If its intent is the ascertainment of a price to be paid by a purchaser to whom is to be transferred the owner's liability as regards future renewals and replacements, then, beyond question, depreciation should be deducted; but, if the amount of capital invested is the point at issue, depreciation, being an element of operating cost and not a wastage of capital, should not be deducted.

DISCUSSION

Mr. Parsons.

Maurice G. Parsons, Jun. Am. Soc. C. E. (by letter).—Valuation, to-day, is the fashion, and rightly so, for only with absolute and complete knowledge of facts can justice be done either the consumer or the producer. Surely, this is a great subject, large beyond the ability of any one commission which has not the thorough support of the entire country and cannot rely absolutely on its assistants. The people, the corporations, and the Profession should most heartily welcome Mr. Wilgus' paper as an endeavor to clarify valuation views more fully and to secure the co-operation of all concerned.

It is interesting to note that here, again, the much-discussed subject of depreciation has come up. There is, perhaps, more written on this phase of valuation than on any other, very largely because, like will-power, it is a sort of composite; depreciation is made up, in part, of red lead, stomach, philosophy, bookkeeping, obsolescence, and the methods of treatment throughout. This divergence of methods causes much trouble. Any one of several logical processes will give correct answers to the question of depreciation, although certain steps in one method may differ entirely from similar steps in another.

The author has approached the subject of physical valuation in the large, showing that it is not a question of so many yards of earthwork, so many tons of steel; but that all parts of a railroad must be combined, fused, and vitalized, that they must be made a single working machine. That, however, is not all; the mere inventory of the physical property (if one may broaden the discussion beyond the limit set by the subject) is only a small part of the problem. Before a board can rightly take from one and give to another, it must have knowledge, not only of the physical value, but of the complete economic and financial history of the company. It must know the total cost of producing the commodity (which cost is at times greatly in excess of that of the physical plant) and the total profit derived from its sale. Promoters may embark in hazardous but necessary business during hard times, with the result of large financial loss in the early days; then again there may be absolutely no risk connected with the building up of the business. The development value may be practically nil. On the other hand, regardless of risks which have been taken, subsequent profits, whether great or small, may alter entirely the question of what equity the public has in the business. The real problem begins after the physical valuation is made, and necessitates a complete knowledge of the history of the company and of the financial and political situation during its life. As the physical value must be determined in a broad-gauge manner, so also the entire subject of rate-fixing goes deeper than mere consideration of physical value.

Mr. Parsons.

One question about which the writer has been thinking is: "Where may our theory of valuation lead?" May we not get back to the old labor theory of value, which held, for example, that if a man produced in one day a clock which kept perfect time, whereas another man labored equally hard for a hundred days in producing an inaccurate timepiece, this second man, nevertheless, was entitled to one hundred times as much wages as the first man. We cannot say that a utility is entitled to a fair profit on all the investment unless that investment has been wisely made, and we must judge past actions with leniency. On the other hand, although the best judgment may have been used, it is possible that business has almost entirely disappeared, and that the company is entitled to a rather high rate—to what the traffic will bear. Rates must bear some relation to the actual cash value of the service and to a proper return on judiciously invested capital. The germ of the solution of this question of policy (which allows a fair return on the actual investment which may be considered to measure the labor, and may bring us back to the old labor theory of value) is contained in the case of Smith *vs.* Ames, wherein it is pointed out that the rates as affecting the welfare of the corporation and the welfare of the people must be considered in the light of a complete history of all conditions. It is to be hoped that this general broad subject will be more elaborately discussed, for on that depends the fair rate. Necessary regulation of present-day business gets us into deeper water than the one-time automatic competition of small companies.

As the value of a property depends on the purpose for which the valuation is made, we have several sub-heads of valuation. First of these may be mentioned the physical value, determined by any one of several methods. Next, we may place the development or intangible value, consisting of various items not properly appraisable under the head of physical value, such, for example, as promoter's profit, legitimate costs of franchise, legal and engineering expenses, certain property rights, present value of past deficits, etc. Thirdly, the business value is the net income capitalized at the current rate of interest. The fourth, or going, value is sometimes used synonymously for the development value, or again with business value. It seems, however, that this is in reality a value by itself, differing from those already mentioned, and that it can very properly be defined as the difference between the business value and what the same investment would earn in a bank. In other words, if a capitalist chooses to let his money lie idle—chooses to be unenterprising—he gets a certain amount of interest. If, however, he sees fit to invest this money in a business, to promote a project, guide it safely through the development stage, put it in a good running order, and make the organization as a whole a single living unit—a going concern—he is entitled to more interest; he is entitled to a fair return on the investment under the particular conditions which he has met and conquered, and the going value is that excess which the business earns over and above what the same money would earn had he chosen to leave it in a bank. The going value might quite properly be defined as the difference between the business value and the idle value.

Mr. Parsons.

Mr. Aldrich.

J. **Frank Aldrich**, Esq. (by letter).—Mr. Wilgus' paper is the "last word" on this present-day subject, and although the writer will confine his remarks to a discussion of the land element involved, it is difficult to see how he is going to raise many issues in the field covered by this paper; for, after some ten years of experience by valuation engineers and a pretty general discussion of the subject, the author has succeeded in eliminating a vast amount of theory and undigested argument—going directly to the meat of the proposition—and from his record as a practical railroad builder and appraiser has evolved basic principles which are both logical and sound. The writer does not mean by this that the subject is beyond the realms of controversy in detail, but as to the hitherto mooted questions of reproductive value, overhead charges, depreciation, etc., the author is most convincing and in accord with the best authorities on the subject.

As with many propositions of professional interest, the opportunity exists for wide-spread discussion, which is sometimes carried to a point of beclouded mental vision. The sooner the subject reaches the practical stage—where justice to all concerned will be the key-note of discussion—the sooner will there be harmony of action between those who, on the one hand, are honestly striving to do exact justice to the general public, and those who, with equal zeal, represent the railroads.

With the railroads (it has been suggested) this public valuation is to be a "two-edged sword," for, if the result is satisfying as a basis for rate-making, how will it operate when it comes to matters of taxation? The writer does not agree with some authorities: that there cannot be one valuation for the one and another valuation for the other. Bear in mind that these remarks are confined, as closely as practicable, to the element of land values (no inconsiderable part of the whole), and when R. A. Thompson, M. Am. Soc. C. E. (one of the Board of Engineers recently retained by the Interstate Commerce Commission under the Adamson Act), asks: "Is there any logical reason why a valuation for this purpose [the issuance of stocks and bonds] should not also serve—as far as it pertains—as a basis for taxation or for regulating freight rates?" and again: "as far as the State is concerned and to be consistent should not one valuation serve all purposes?" the writer answers, to both queries, emphatically, "no"! If an individual or corporation decides to build a railroad, he, or it, must acquire a right of way, which it is conceded will cost per acre,

Mr. Aldrich.

through the country districts, from two to five times the normal acreage values of adjoining land. The fact that it costs this amount more, does not make it worth more, and it should be assessed (for taxation) at what it is worth, not at what it has cost. The reasons for its costing more to the railroad will not be discussed here, for that is now axiomatic and elementary. It is enough to say that it does cost more, as every one who has had broad experience in buying right-of-way property for railroads knows; and it would be a gross injustice, as well as a blunder, to tax the strip of land used for right-of-way purposes at its cost, say, $100 per acre, when the adjoining land is assessed at $25 per acre.

Mr. Thompson cites the Texas valuation, where he says his experience as Appraising Engineer for more than 10 years with the Texas Railroad Commission confirms his belief that, in the absence of actual figures of cost, right of way and other real estate should be appraised at but little in excess of the market value of abutting property, and adds: "the conditions under which the railroads were built in Michigan, Wisconsin, Iowa, and Minnesota cannot have been radically different from those in the southern and western states."

Now, let us see: In the Michigan Appraisal* two illustrations are given to indicate the factor that should be used for reproductive values:

1.—The Pere Marquette Railroad, in Montcalm County, paid an average price of $135.19 per acre, and the 1900 appraisal showed an average of $29 per acre on the 918 acres appraised........Factor, 4.66

2.—The Grand Trunk Railroad paid $491.13 per acre for 63.2 acres, and the 1900 appraisal showed $61.44, or only one-eighth of the actual purchase price..Factor 8

Twenty-three illustrations in fourteen counties showed that the average cost of lands was from 230 to 726% higher than the 1900 appraisal, and this, too, "after the 125% and fixed charges had been added" to the appraisal values.

In Wisconsin, the late W. D. Taylor, M. Am. Soc. C. E., the State Appraiser, said:

> "In farming lands, small towns, and suburban and residence property, the right-of-way value was taken to be 250% of the market value for other purposes," and notwithstanding Mr. Thompson's conclusion "that, in the absence of actual figures of cost, right of way and other railroad real estate should be appraised at but little in excess of the market value of abutting property."

Mr. Thompson says: "For rural property, the ratios used by Professor Taylor in the Wisconsin appraisal appear to be quite fair."†

In Minnesota, Appraiser Morgan's findings (after employing several special agents who made a study of transfers and assessed values over the State) were, that in the State at large, exclusive of the St. Paul, Minneapolis, and Duluth Terminals, a multiple of 3 was proper, while in St. Paul he used 1¾; in Minneapolis, 1⅗; and in Duluth, 1¼.

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* *Transactions*, Am. Soc. C. E., Vol. LXXII, p. 57.

† *Transactions*, Am. Soc. C. E., Vol. LXXII, p. 205.

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Professor Taylor thought city property should be put in at 133% of market value in strips of 100 ft. width or less, and at 110% where the land was owned in blocks or in width greater than 100 ft. It is evident, however, that no "hard and fast" rule will apply to all parts of the country. Varying conditions appear along different lines, even in the same State. As stated by Henry Earle Riggs, M. Am. Soc. C. E.:*

> "It is comparatively simple to fix within very close limits the reproduction cost of tracks, bridges, locomotives, or any of the other elements of physical valuations. Not so with the land."

And again:

> "It is impracticable entirely to eliminate differences due to error of judgment on the part of appraisers. Where these differences do occur, experience must be the governing factor."

Were the records complete, an abstract of cost prices to the railroads, together with transfer considerations of adjoining land, and assessed valuations, the problem would be simplified, but, except in isolated cases, such records are not available, and the appraiser must be guided in large part by his or others' experience in the actual purchase of rights of way and other real estate for railroad use. He must be fortified with ample local testimony as to basic values and the individual knowledge of local real estate agents or railroad employees who have personal information as to actual transactions. When practicable, he should examine recorded transfers at the county seats for a number of years back, and take notes concerning the assessed valuations on properties contiguous to the railroad. All this collateral information, including the names and addresses of local authorities, should be carefully preserved and indexed for ready reference. As Mr. Wilgus indicates—land valuations should be directed from one central head, from one whose experience in acquiring property for railroad use (whether by purchase or through condemnation proceedings) has given him the fundamentals which cannot be ignored in the fixing of reproductive prices.

The appointment of local appraisers has not resulted satisfactorily. Fixed opinions or local prejudices frequently exist among appraisers of good repute, and lack of harmony is bound to show in the returns. A well-drilled force of assistants, organized and directed by the chief appraiser, will produce the best results, and, as the author well says, "avoid the inconsistencies and errors which are common where the work is entrusted to a multitude of local men unversed in the broader aspects of the problem."

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* *Transactions*, Am. Soc. C. E., Vol. LXXII, p. 139.

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That problem is: What would it cost to reproduce for railroad purposes the land and other real estate now occupied by a given railroad—other conditions adjacent to and through the country traversed by it being as they are at present?

It is immaterial that the railroad itself may have been in large part responsible for the development which its own operation has brought to the surrounding property. It is inconceivable that the added values which have come to adjoining lands owned by A, B, and C should not be reflected in that owned by the railroad. The assessor certainly thinks it is. If one is in doubt about it, look up the record, for instance, of the increased assessment for 1913 on the terminal lands of the New York Central Railroad Company in New York City.

However, consider for a moment the question of "original cost" of rights of way. Unfortunately, the records of these purchases are not always—in fact are seldom—obtainable. In many cases they are not in existence, so that, to make any practical, general use of such data is out of the question; and, if they were available, their examination and tabulation would involve an amount of labor hardly commensurate with their importance to this subject. It will be interesting, however, to give a few examples which illustrate the elements to be reckoned with by the buying agent when he undertakes the purchase of rights of way. A recent case is that of a road now under construction just over the border line of Canada, which is not dissimilar to some of those on this side of the line. The road in question is to run along the north shore of Lake Ontario—through a fruit belt of much the same character as that traversed by a railroad on the south side of the same lake. The writer was considerably puzzled in fixing the reproductive values along the latter line, for there was but little information available covering the original purchases. The writer's assistant in that work was engaged later in valuing the right of way of the railroad on the north side of the lake and had access to the records of purchase. The twenty-five examples, Table 1, are from that record. The right-of-way agent states that his estimate indicates that the cost of the entire right of way will average between six and eight times the normal value of the adjoining land.

In the examples given in Table 1, improvements and what may be termed consequential damages are alone considered. The names and addresses of owners are known, but are omitted from the table.

If the true values of the land alone were represented in these data, the reproductive value would be represented by the percentages given, which, it will be noted, run from 200 to 800, but the right-of-way agent assures us that the prices allowed for the land alone were fully double their normal value.

Mr. Aldrich.

TABLE 1.

Example No.			Total cost.	Percentage.
1	3.15 acres of land	$200.00		
	Fruit trees	300.00		
	Moving house and shed	350.00		
	(Crossing reserved)		$800	$400
2	Land	300.00		
	2 wells	125.00		
	Moving house and shed	525.00		
	(Crossing reserved)			
	Fruit trees	250.00	1 200	400
3	1.67 acres of land	125.00		
	Angling field	100.00		
	Water cut off	50.00		
	Trees	75.00		
	(Timber reserved)		350	280
4	2.25 acres of land	135.00		
	Drainage, 80 maple trees	215.00		
	Angling farm	100.00		
	(Timber reserved)		450	333
5	1.55 acres of land	116.00		
	Angling farm	100.00		
	Water cut off	125.00		
	Moving fence	9.00		
	(Farm crossing)		350	300
6	3.3 acres of land	247.50		
	Angling farm	100.00		
	Water cut off	150.00		
	In lieu, farm crossing	52.50	550	222
7	1.75 acres of land	131.25		
	Severance from water	125.00		
	Angling farm	100.00		
	Fall wheat	13.75	370	282
8	3.6 acres of land	360.00		
	Angling—4 fields	200.00		
	Water cut off	150.00		
	Shade trees	40.00		
	(1 farm crossing)		750	208
9	1.5 acres of land	150.00		
	Angling and changing fences	150.00		
	Water cut off	150.00	450	300
10	Land	200.00		
	Water cut off	100.00		
	Crossing inconvenience	200.00		
	Rocky land—crossing reserved		500	250
11	5.75 acres of land	550.00		
	40 apple trees	900.00		
	Gravel pit	50.00	1 500	273
12	2 acres of land	200.00		
	House and shop	600.00		
	80 trees	1 600.00	2 500	833
13	Land	100.00		
	10 apple trees	250.00		
	5 plum trees	60.00		
	Moving barn	50.00	460	460
14	Land	100.00		
	Apple trees	280.00	380	380

Mr. Aldrich.

TABLE 1.—(*Continued.*)

Example No.			Total cost.	Percentage.
15.	House and land	$150.00	$600	$400
	26 fruit trees	450.00		
16.	1.72 acres of land	525.00	2 000	381
	Apple trees	1 080.00		
	Berry patch	395.00		
17.	3.03 acres of land	600.00	1 500	250
	Apple trees	900.00		
18.	1.53 acres of land	200.00	700	350
	Apple trees	450.00		
	In lieu, farm crossing	50.00		
19.	1.15 acres of land	150.00	500	333
	Apple trees	250.00		
	Berry bushes	50.00		
	In lieu, farm crossing	50.00		
20.	3.17 acres of land	455.00	1 000	220
	Water	300.00		
	Inconvenience	145.00		
	Crossing railway	100.00		
21.	1.5 acres of land	210.00	600	286
	Apple trees	175.00		
	Strawberries	150.00		
	Damages	65.00		
22.	3.1 acres of land	465.00	2 350	505
	In lieu, farm crossing	100.00		
	Deep cut through orchard	158.00		
	66 large apple trees	1 452.00		
	25 small apple trees	175.00		
23.	Land, 3.95 acres	450.00	1 000	222
	Damages for cutting off water	350.00		
	Damages for crossing track	200.00		
24.	1.37 acres of land	400.00	1 200	300
	House	300.00		
	35 apple trees	250.00		
	Well	100.00		
	Removing barn	80.00		
	17 plum and pear trees	70.00		
25.	0.92 acres of land	200.00	1 000	500
	27 fruit trees	540.00		
	Strawberries	100.00		
	Damages to building	160.00		

TABLE 2.

Town.	Acres.	Cost.	Average cost per acre.
West Haverstraw	22.45	$56 195	$2 500
Stony Point	104.77	187 670	1 800
Highland	105.26	183 985	1 800
Cornwall	35.78	71 530	2 000

Not any of this land is in West Point, which is a Government reservation. This company occupies under a lease from the General Government.

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It may be said that these are isolated cases, and represent but a small percentage of the entire right of way. This is true in part, but the percentage is not as small as might be supposed, on the other hand, not one of them was a condemnation case. Every one was a purchase, in which an agreement was readily reached between the buyer and the seller. Many owners are holding out for extravagant figures, and condemnation proceedings will follow; commissioners must be paid, and attorneys' fees will add to the expense. The railroads seldom "get the best of it" in cases of this kind, so that we may fairly conclude that the right-of-way agent's estimate of 600 to 800% in this instance fairly indicates the ultimate cost to the company.

A case in point to illustrate how difficult it may be for the appraiser to arrive at a fair value—or rather cost—of right of way, came under the writer's notice in appraising the lands of the West Shore Railroad in 1911. His assistant had gone over the road in advance, and reported an average valuation of the lands between West Haverstraw (north of Haverstraw proper) and Cornwall at from $100 to $300 per acre, basic, and had placed a reproductive value on it at from $300 to $750 per acre. The writer questioned his figures, and went into the matter carefully. Much of this right of way runs along the Hudson River at the foot of precipitous mountain sides—in fact, practically all of that which is in Orange County. Railroad construction there was most difficult. Above West Point there would seem to be but little actual value in the land. Fortunately, the writer was given access to the records of purchase (made in 1886) and was dumbfounded to find the total cost of these lands to be as given in Table 2.

The explanation of the high figures in Table 2 is to be found largely in the consequential damages due to severance, as the river was cut off from large estates by a railroad right of way at grade.

Another example which came under the writer's observation was on the Lehigh Valley Railroad near the Town of Wysox, Pa., where it became necessary to buy a house and lot to gain an additional 20 ft. of width for the right of way. The sum paid for this property was $10 000, and the house with the remainder of the property was sold for $5 000, making the 20-ft. strip (worth normally perhaps $500), cost the Railroad Company ten times its actual value. "Consequential damages," it will be perceived, is no small matter in railroad construction. A whole chapter might be given to this subject in view of the important and growing demand for the elimination of grade crossings. One example alone, which came under the writer's notice, may suffice for illustration. The New York Central Railroad paid, as its share, $3 132.98 and $32 592.87, respectively, for these eliminations at Seneca Street and William Street, in Buffalo. The total awards for these two crossings amounted to $7 531 and $65 185.63, respectively.

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"Franchises and Street Crossings" is another branch of this subject to which much space might be given, but it is not the intention at this time to discuss any of these matters extensively. The writer has tried to give, as briefly as possible, some of the reasons "for the faith that is in him," and has given a few examples which have come to him through experience in this work to justify that faith.

The commonly accepted method of arriving at franchise value, through gross earnings and revenue, will hardly apply to railroad corporations, and it is perhaps of questionable propriety that any account should be taken of corporate franchise when applied to its charter. With this the writer has nothing to do; but, to ignore the element of value which applies to local franchises or rights to occupy or cross streets and highways, or even streams, would hardly be sound. Has the Park Avenue franchise, granted many years ago to the Harlem Railroad for an entrance into New York City, no appraisal value? Has the franchise which permits the New York Central and Hudson River Railroad Company to occupy Washington Street, Syracuse, for a distance of 1.2 miles no value?

The cost of a private right of way through either New York City or Syracuse, at the time these rights were granted, would have been comparatively insignificant. What is the right of way through the heart of Syracuse worth to-day, and how many millions of dollars would it take to purchase a private entrance to 42d Street from the Harlem River (more than 4 miles) if it had to be bought to-day? It might have been acquired for considerably less than $1 000 000 then —could it be duplicated for $25 000 000 now? Is genius and foresight to have no credit for risks of failure taken fifty or more years ago? Should capital invested in this particular line of business be singled out for attack and be deprived of the same natural benefits which come to other investments made in the same period?

The general rule to be followed in arriving at a just value of the space occupied by a railroad, at a street, or highway, or navigable stream crossing, is to multiply the average value of the abutting property on both sides by the area and divide by two, on the theory of joint occupancy by two interests—the public and the railroad. If the crossing be occupied by three interests (whether at grade or otherwise) then the divisor is 3, and so on. The same rule will apply to street or highway occupancy along and through the streets, unless sole occupancy of a given space is enjoyed by the railroad, when, if the right is perpetual, full value is taken.

Rights of way along and through streets, not at grade, should be estimated at one-third the value of the surface land.

These rules are quite general, and have been adopted as the result of careful thought and analysis growing out of study and experience in this feature of the work. All crossings not at grade are attended

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by increased cost of construction to the railroads, and, if at grade, the cost of watchmen, or otherwise safeguarding them, puts an added burden on the railroad. If further justification be needed for including a value for public crossings in this estimate, it should be remembered that revenue is based on mileage to a large extent, and that, therefore, the value of every foot of right of way should be properly considered in some logical manner.

As to what lands, if any, owned by a railroad company are to be eliminated from consideration—in the matter of rate-making, for instance, the appraiser has nothing to do—that is a question for the Interstate Commerce Commission and the railroad company to settle. It is the appraiser's business to appraise all the lands of the company, and, in fixing his value, to differentiate between lands actually in use or needed for the operation of the railroad, and those which have been abandoned, such as depleted gravel pits, parts of original right of way, and even where surplus land has been acquired for future yard extensions.

It may be contended, for instance, that houses erected by the company, or purchased by it, for housing employees in the vicinity of shops or transfer yards, is not real estate proper to be included in a valuation for rate-making or of consideration in the issuance of the company's securities. However that may be, it will not affect the method to be used in its appraisal. It is "outlying" property, in any event. The company would not be confined to one particular location for such facilities, and its reproductive value would be the bare value of the land and the present depreciated (if any) value of the houses. Exhausted gravel beds or abandoned right of way would in most cases have but nominal value. Many similar instances could be mentioned, but common-sense judgment in most instances will govern. Large tracts of land purchased for yards, water supply, etc., are ordinarily acquired at a smaller figure, relatively, than right-of-way strips; on the other hand, "plottage" is an element to be considered, particularly in cities; so that no fixed rule will apply.

The question of land or money donations can be disregarded, for two reasons: First, because property is property always, and whether the railroad company or an individual has acquired lands without monetary consideration, or at a low figure, or as part consideration for the risks of investment, its value is an entity and cannot be ignored, either by the assessor or by the stockholder. Second, the practice of donations is a thing of the past—and we are dealing with the present. As part of the "original cost"—that is another proposition. There is no special rule for appraisal based on population that will apply. This will be disclosed by conferences with real estate men in different parts of the system. The attitude of owners will be found to be widely different in different places, but it will be found to be very nearly axiom-

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atic that the more valuable the land required, the less the size of the factor which should be used to indicate its reproductive cost. This becomes evident when the company negotiates for a right-of-way strip through waste lands. An acre held by an owner here, or a few acres by another owner there, may be worth only $5 or $10 an acre, but, unless the wily farmer can get $50 per acre, it will, as a rule, go to condemnation, where the expenses will surely bring the cost up to the holding price.

Before leaving this subject, the writer should perhaps mention one or two additional examples to illustrate what has preceded. The normal value of land in Jersey City, where one of the shorter branches of the Lehigh Valley Railroad crosses the main line of the Pennsylvania Railroad, is 60 cents per sq. ft., but it cost the former company $3 per sq. ft. to acquire an easement under the latter line (through Court proceedings, if the writer remembers correctly), and later the Pennsylvania Railroad Company paid the same price for a portion of the Lehigh Valley property at the same point.

At another point, in Bayonne, it cost the Lehigh Valley Railroad $1.50 per sq. ft., when the normal values at that point were 25 cents per sq. ft. In Joliet, Ill., the following case came under the writer's observation: The right of way of the Rock Island Road was relocated, and it became necessary to tear down a 5-story hotel building, worth approximately $100 000. An appraiser, going over the line in later years, might have no knowledge of this, and no consideration would be given to it, yet it was a part of the cost to that railroad. In fact, other buildings at this point were either totally obliterated or there were consequential damages amounting to several hundred thousand dollars; and these are by no means isolated cases. Therefore, if the records were in all cases intact, a valuation based on "original cost," would be quite as satisfactory to the railroads as any reproductive valuation that could be made.

There are other elements of interest which enter into a proper consideration of the question. The rather perplexing problem of fixing a fair valuation on docks, piers, and water-front terminals will not be discussed at this time, nor the asset value of the virile railroad organization, which only time and a high order of executive control develops.

The "Physical Valuation of Railroads," as a science, is still in its infancy. The Courts probably appreciate this, and will no doubt be influenced in their rulings by the results which, as time goes on, will be worked out by engineers and students who are giving their time to the solution of these problems.

The Supreme Court decision in the Minnesota Rate Case was announced just as the foregoing had been written, and, after a careful reading, the writer finds no good reason for changing the views which he has just expressed. It does not seem possible that the land features involved could have been properly presented to the Court. Like others who have discussed this problem, it does not differentiate between the terms "Value" and "Cost." The Court says:

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> "It is at once apparent that, so far as the estimate rests upon a supposed compulsory feature of the acquisition, it can not be sustained," and again, "it is also said that this price would be in excess of the present market value of contiguous or similarly situated property," but (it adds) "supposing the railroad to be obliterated and the lands to be held by others, the owner of each parcel would be entitled to receive on its condemnation its fair market value for all its available uses and purposes," and:
>
> "Moreover, it is manifest that an attempt to estimate what would be the actual cost of acquiring the right of way, if the railroad were not there, is to indulge in mere speculation" and "the values of property along its line largely depend upon its existence" and, finally, "the assumption of its nonexistence, and at the same time that the values that rest upon it remain unchanged, is impossible and can not be entertained."

All of these arguments, with the exception perhaps of that contained in the last stanza, have been anticipated, and have been fairly met in the writer's consideration of the subject up to this point. There is force in the proposition that values based on present conditions might not obtain, in the event of the non-existence of the right of way. The argument is that the railroad, having been long established, has created values based on its very existence. Their determination, the Court holds, would be "wholly beyond reach of any process of rational determination." Much might be said on this phase of the question, but, the writer thinks, it is susceptible of demonstration that, as a rule, railroad terminals in cities tend to depreciate the value of contiguous property. Good examples of this may be found in Chicago and Buffalo, where real estate men know that the least desirable—and consequently those which have the lowest values—are those properties which surround the railroad terminals. The writer knows of no city, in fact, where this does not apply.

The location of a railroad right of way through the country is usually determined by natural laws, and the farm values affected by its construction extend, ordinarily, for some distance on each side of it, but farmers state that the effect of the building of the right of way immediately adjacent to their property is to depreciate its value, and testimony of this nature is commonly accepted in condemnation proceedings.

Heretofore, the generally accepted theory has been that reproductive values should be based on the present market value of contiguous property, plus whatever increment experience and available data might indicate as proper to add to bring it up to its actual cost to the company. Subject to any further review of the question by the Court of

Mr. Aldrich. last resort, its recent decision must stand, but this does not preclude testimony as to actual cost. The unfortunate situation is thereby created, however, of making it possible for a company owning a line constructed in recent years to produce and get the benefit of such testimony, while the records of older lines may not be available. Records of land purchases for many of the Southern roads, for example, are said to have been destroyed during the Civil War.

A valuation of these properties, based on market prices of adjoining lands, might and probably would result in great injustice to them. The Court refers to this added increment as one "over all outlays of the carrier and over the values of similar land in the vicinity," and says:

> "It is an increment which can not be referred to any known criterion, but must rest on a mere expression of judgment which finds no proper test or standard in the transactions of the business world. It is an increment which in the last analysis must rest on an estimate of the value of the railroad use as compared with other business uses."

Herein, the writer thinks, the Court is again at fault, if it applies the principle to railroad valuations generally. In the important railroad land valuations made by the writer, he has never considered "railroad use" as an element of valuation, nor has he heard that term used in this connection. It is not railroad use, it is not alone value, but it is cost that justifies the use of the added increment in making these appraisals. The latter are not used to cover "hypothetical outlays," as the Court asserts, but are based on sound reasoning born of experience and fortified with enough, if not all, actual cases to justify this conclusion.

Mr. Eaton. J. Shirley Eaton, Esq. (by letter).—Mr. Wilgus' paper is comprehensive and critical, and is probably the most succinct statement of the problem which has been made. Its distinctive value lies in its emphasis on the indirect elements of cost of reproduction, which are the inseparable incidents of any actual work. Amateurish valuation fails at this point: It tends to limit its scope to the inventory of physical things at physical measurements at time of valuation, extending the parts inventoried at arbitrary unit prices. The practical engineer understands the necessity of large allowances for contingencies, for errors of judgment, and for changes of detail in the course of construction. Each section of road built involves its special risks and adjustment to local conditions. From the standpoint of personal experience the writer would reproduce a railroad property, carrying it through all the stages of an actual construction under usual conditions. Not only would he include supervision, accidents, taxes, and administrative expense, but he would make provision for the costs of capital that must be held in suspense during the period of construction, and also for the necessary working capital.

In assigning the work of valuation by geographical divisions, under consulting expert supervision for right of way, signals, and special construction, the author keeps his controlling factors in co-ordination, and gives due weight to local conditions. In predicating an assumed interest rate of 6% on an allowance composed half of stock and half of bond financing, he ignores the fact that many railroads are financed on bond issues alone. Mr. Eaton.

A distinction between valuations according to the purpose which they are intended to serve, is unfortunate. A "valuation" should always be complete and the same thing, having reference to that entity which is defined by the operating income. The law is properly criticized in its provision for a valuation less depreciation. A railroad, as this paper so well emphasizes, is not an aggregate of parts, but an organism of parts, progressively integrated and evolved into a homogeneous whole to produce an operating income. The physical parts have two factors of efficiency which, as capital, must be maintained unimpaired, namely, what may be called the current efficiency and the life efficiency. Every year of use exhausts a year of the life efficiency, and so far reduces the capital value of the original plant. Income account, through which are made the adjustments to maintain capital unimpaired, must bear the charge of accumulating the offsetting reserves from which this reduction of life efficiencies is restored later. Otherwise, the net earnings are overstated to the extent that they have not made allowance for dissolution of the plant. In theory, a net earning figure can reproduce itself indefinitely out of the existing plant. A plant from which depreciation has been deducted will not permit of the indefinite reproduction of existing earnings, and a valuation based on original cost less depreciation, therefore, does not represent the necessary capital involved for the continuation of operating income.

The author touches lightly on the mooted question of including unearned increment in valuation, although this is the storm center about which most of the controversies will arise. In the same category with unearned increment are those values in the physical property representing donations by the community, state, or nation, and the reinvested surplus out of questionably excessive earnings of earlier years. Nor does he touch on another point sometimes urged—the practice of carrying the unearned increment through income account instead of through profit and loss, and thus establishing a rate of return that shall reflect back on the capitalization permitted, which practice would be distinctly wrong. We are at a time when principles of private property in a simple economic society are being complicated by the intrusion of vast values which are the direct result of social production. The analytic methods of latter-day bookkeeping are tending to

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distinguish these values from those created by individual enterprise and effort, and to relate them to the sources from which they spring. The problem of how to make this distinction and how far to carry it, becomes a critical and real issue with railroad property first, only because here are gathered, in orderly array, vast aggregates of property to which formulas are more easily applied than to the miscellaneous array of property held privately. We are not ready to believe that the conditions of railroad investment are so different as to make them an exception in this particular, but the question that is raised first in this connection will doubtless be extended in time to include privately held properties as well as those devoted to public utility.

One general criticism of this paper, which applies to all treatments of this subject, is the author's indisposition to strike at the social principles involved and his inclination to limit the discussion to terms and concrete phases. The law is not an illuminating guide. The principles of valuation are not yet stated or known, and while they will be evolved inductively in the concrete studies which the practical application of the law imposes, nevertheless, it would be advantageous, in discussing the matter, to have a leading thinker like Mr. Wilgus intimate the larger social consequences of the undertaking. With these wider aspects before us, in meeting the miscellaneous questions as they arise, there will be built up, not only a practical plan of valuing railroads, but a body of experience out of which will emerge a restatement and a more specific definition of property.

Mr. Howard.

C. P. Howard, M. Am. Soc. C. E. (by letter).—In the text of the so-called "Federal Physical Valuation" law, the word "physical" occurs once in connection with classification of property. It also occurs once in a marginal subheading. The law, however, provides for a complete valuation, including "other values, and elements of value, if any," and the "present value" of "all lands, rights-of-way and terminals."

In this connection, the writer desires to call special attention to the subject of land values; to certain important elements which affect such values; to other elements of great importance which affect them from a railway standpoint; and, very briefly, to the question of whether these latter should be considered as "land" or "intangible" values.

A mere statement of facts as to the existence and importance of some of these elements might appear sufficient, and any argument on the subject as an attempt to demonstrate self-evident truths; nevertheless, in view of a recent Court decision, a thorough consideration of the subject would seem to be in order.

Suggested Definition of Value.—What is the value of a piece of property? The following definition is suggested: "The value or market value of a property is its greatest actual value for any lawful purpose for which it may be used and for which there is a demand."

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A piece of ground may have no value for industrial or agricultural purposes, but it may have a high value as a residential site. Another tract may be valuable as a site for a wharf, railway terminal, or something else. Its highest value governs; or, if it has value for more than one purpose and can be used simultaneously for both, the sum of the values will govern—for instance, fertile farming land underlaid by a coal vein.

Cost of Right of Way.—Mr. Wilgus calls attention to the items of "severance and other damages, plottage, etc."

A narrow strip of land laid off across the country without regard to existing boundary lines cannot be purchased at the price obtaining for ordinary farm lands. As a general proposition, nobody would sell such a strip, splitting his farm in two, for anything like the price per acre which would apply to the farm as a whole. Considered as an article of commerce, it costs more to produce it. To the ordinary price for land must be added the depreciation in value of the remaining land, due to separation of parts and other damages. The Courts recognize this in provisions for damage to the residue. The law does not allow any general increase of land values to offset "damages to the residue"; if it did, the man with a farm near the railroad, but not touched by it, would receive the full benefit, and have an unfair advantage over his neighbor who would have such increase deducted from his land damages. An increase in price, therefore, is lawful, just, and customary.

When a railroad is needed, and such a strip is judiciously located, the demand for the property is imperative, even at such increased price.

Its increased value is due to its shape, position, continuity, etc., elements quite different and distinct from its original value for farming or other purposes, and having little relation thereto.

Continuity.—The continuity of a railway right of way is undoubtedly a most important element of its value. A right of way along a mountain stream might be extremely valuable for railway purposes if continuous; but if it is blocked by some impassable obstruction at one point, it would have no value whatever. This, of course, is self-evident.

Value for Railway Purposes.—Railroad companies have fought each other "tooth and toe-nail" for gaps and passes through the mountains, and elsewhere. In these cases the value for a lawful purpose and the active demand for same are perfectly evident. Among a number of contests of this sort, which have come under the writer's observation, the following instance may be cited:

Two railroad companies located their lines through a gap in the mountains. A bought the right of way. B claimed prior location and sought to condemn. The lower Court decided for B, and testimony was taken as to the value of the land. An engineer for A, questioned

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as to its market value, placed it at $25 000, based on value to its owners for the purpose for which they proposed to use it, that is, for the construction of a railway tunnel. Its value for any other purpose would have been a mere trifle. The sequel is interesting. Road A, being deprived of its right of way, went ahead with the construction of a longer tunnel on another line a few hundred feet south of the main gap. Road B completed the tunnel through the main gap. The Superior Court on appeal decided against Road B, and Road A then had two tunnels.

As a matter of fact, it is perfectly evident that the value of land for railroad purposes is a distinct and important element of value. One line may be worth as much or more than another line which cost considerably more to build, its greater value in excess of cost being altogether due to its more favorable location, that is, the greater value of its land for railway purposes. This does not necessarily imply a difference in engineering skill, the first line having first choice in the selection of its route.

Existing railroads in many parts of the country occupy natural or strategic routes which, from the shape of the land and the general configuration of its slopes, are especially adapted to railroad purposes. At present, these routes are of great value, and are likely to become more so in the future.

The importance of passes and defiles in the mountains is well known to engineers; for instance, the New River Gorge, occupied by the Chesapeake and Ohio Railway; the Ohio River below Pittsburgh; the Allegheny, Monongahela, and Youghiogheny Rivers at and above Pittsburgh; and the Susquehanna above and below Harrisburg.

Let any one spread out the sheets of the U. S. Topographical Survey from Pennsylvania to Georgia, note the railroads which have recently been built, and study the situation carefully. He will see how difficult, if not impossible, it will be to get another low-grade railroad line from the Ohio River to Chesapeake Bay, or to any point on the Atlantic Coast, below Norfolk, without using the tracks of an existing railroad. The Potomac, James, and Roanoke are the only rivers which cut through the Blue Ridge Mountains. On the route from Pittsburgh to the Potomac both banks of the Youghiogheny are occupied; this is also true of the Potomac from Piedmont to Cherry Run, near Hagerstown, Md. Between the Potomac and the Chesapeake and Ohio Railway, are a number of high ranges running northeast and southwest, and lapping past each other like interlocked fingers. From the Chesapeake and Ohio, on New River, southward to the Norfolk and Western Railroad, there are numerous ranges of hills and mountains; and from Roanoke south to Rabun Gap, Georgia, the eastern slope of the Blue Ridge falls off like the roof of a house, with the highest mountains of the Alleghanies to the west, and still farther west lie the Cumberland Mountains.

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It is impossible to state how many other railroads would have been built from Pittsburgh east, if there had been a place to put them, or how many east and west lines south of the Potomac; one would have to be familiar with all the various surveys of proposed railroads. The writer knows of one company which attempted to build west, in the territory between the Potomac and the Chesapeake and Ohio Railway; it built a short distance and stopped.

The value of ground for railway purposes, or its location value, is well illustrated in the case of terminals in a large city. If the business is sufficient to justify the construction into the city of a new line (B) at a cost of $10 000 000, then, as a matter of fact, the value of the old line (A) entering the city from the same direction and giving the same facilities, would be not less than $10 000 000, even though the cost of reconstructing it on its present location should be estimated at one-half or one-third that amount.

It may be assumed that the old line, having first choice of location, cost less as to physical features of construction, including grading, bridges, etc., that its land cost less, and that at present it would cost less, if valued on the basis of adjacent property without improvements. The new line, however, has to buy property with improvements; then tear them down, and build its own structures. Stated in another way, the value of an existing line is evidently not less than the cost of its reproduction on a new right of way, when sufficient demand exists to justify the construction of an additional line; and as no one will invest without expectation of increase, to this value should be added a reasonable percentage for profit.

When the business of the route will support only one road, any special value due to its advantageous location is not so apparent. But if the business is increasing toward the time when it may no longer be accommodated by the increased number of tracks of the existing road (and it is only a question of time when a second and more expensive line will be required), then the value of the location of the existing road, or of its lands, for railway purposes, may be said to be likewise increasing.

Credit for Location Value.—It has generally been conceded that the owner of property is entitled to its value for any lawful use, such as farming, building, etc. It is not the writer's purpose to suggest who should be credited with the special value of land for railroad purposes—the State or the railroad—but rather to emphasize the fact that this value exists.

How to Estimate the Value of a Location.—Railroad companies, if left to themselves, might settle the value of their lines, including that of location (or that of their lands for railway purposes), by the natural

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process of competition, provided they did not combine; but if the Government decides to make a complete valuation of railroads for purposes of rate-making, it must consider the various elements which would fix the value according to natural laws of supply and demand, such as the cost of construction, number of available routes, and number of roads, tracks, etc., necessary to handle the business.

If it decides to give a railroad company the credit (or, in some cases, perhaps, the debit) of the value of its location, or the adaptability of its land for railroad purposes, how may such value be determined? This is a difficult problem, yet railroad companies have had to solve it in the past, and, if left to themselves, will have to do so in the future. It takes investigation, time, and money. To consider it as an "intangible" rather than a land value makes the problem no easier, if an attempt is made to ascertain its amount in dollars and cents. It must be remembered also that railroad companies themselves have not asked for this investigation.

The process of determining the value of a location, as practised by railroad companies, is simple enough in a way; but it is expensive and tedious. A company desiring to build through a certain territory and finding the natural route occupied by another road, makes careful surveys and estimates of the cost of building an alternate line. If it costs too much, an endeavor is made to secure trackage rights over the existing line. If it is found necessary to build the new line, then, other things being equal, the excess cost of the new line over the old, actual or computed, may be taken as the value of the location of the old line, or the excess value of its land for railway purposes.

"Location," "Land" or "Intangible" Values.—There are certain cases where the cost of reproduction on a new right of way would seem to be a logical method of determining the value of land for railway purposes—in other words, the cost of reproducing the right of way; there are other cases where this method might be used as a check or side light. It probably makes no difference whether it is considered as "physical," "tangible," or "intangible," provided all existing information is used and every effort made to determine its true or probable value.

Mr. Brinkley.

M. H. Brinkley, Assoc. M. Am. Soc. C. E. (by letter).—While the general principles enunciated by the author are interesting, and the paper is a valuable contribution on the subject of valuation, the writer desires to take issue with some of Mr. Wilgus' conclusions.

Since the paper was published, the decision of the U. S. Supreme Court has been made public, and its conclusions have been very far-reaching in regard to the value to be considered for rate-making purposes. It clearly sets forth that rates should be charged on reproduction value less depreciation, or what might be called depreciated reproduction value. A quotation in part is as follows: "When an estimate of value is made on the basis of reproduction new, the extent of existing depreciation should be shown and deducted." As the significance of the case was the question of rates, there is no doubt of the consequence of the decision that rates should be based on depreciated reproduction value.

Mr. Brinkley.

In the following discussion depreciated reproduction value will be called present value.

After a railway is built, renewals do not take place at once, but additions and betterments may be made, the cost of which should be charged to capital account. Starting with the property new, there will be a gradual depreciation, based on the rate of depreciation of the different elements of the property. When it is necessary to renew the items of shortest life, allowance must be made for the expense of replacements.

Assume that from the beginning of operation of the railway, the earnings have been sufficient to pay interest on the investment and create an accrued depreciation fund, which, at the end of each year, is equal to the depreciation below reproduction value. If, however, no fund has actually been created, then before renewals start, the net income is larger than in later years by an amount equal to the average annual renewals of the later period. Advantage may be taken of this by paying larger dividends to stockholders, or the amount may be placed in additions and betterments. The latter is frequently done, for often on railways recently built a large number of improvements take place. In either case, the stockholders gain, and there is what amounts to a repayment of capital invested.

For a property which has never made payments into a depreciation fund, the yearly replacements must come out of earnings. Assume that the railway is composed of a large number of elements of different life, such that after a certain age is reached, the present value remains constantly at the same percentage of reproduction value, due to the fact that replacements are the same in amount each year. This is not a special case, as a large amount of railway mileage approaches this condition very closely. If the property is allowed to earn interest on present value, and the cost of the annual replacement is provided for, the rates charged to the public will be the same as if a depreciation fund had been established at the beginning, being kept approximately equal to the total depreciation and earnings continually allowed on reproduction value. In this argument, it is assumed that the rate of interest on the depreciation fund is the same as that allowed on reproduction and present values. The proof of the above proposition is as follows:

Let i = rate of interest allowed on reproduction or present values;
a = rate of interest on depreciation fund;
R = reproduction value;

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P = present value;
N = annuity required for contribution to a depreciation fund established at the birth of the property, which fund at the end of a certain period will remain equal to the depreciation below reproduction value;
D = value of the depreciation fund;
and A = cost of annual replacements.

Then in the case where earnings had always been allowed on reproduction value and a depreciation fund provided, which after a certain age remains equal to the total depreciation, interest on the reproduction value plus the amount of the annuity must be provided by net earnings, or $iR + N$. As the property is assumed to have reached an age when the annual replacements paid for out of the fund are constant, as well as the depreciation fund, it follows that $aD + N = A$, or $N = A - aD$. Substituting for N its value, the net earnings must amount to $iR + A - aD$. But $R - D = P$, and if $i = a$, the amount to be provided by net earnings becomes $iP + A$. This proves the proposition, as the same amount emerges, which it is contended should be allowed for net earnings where no depreciation fund has been provided. It seems to be clear from the foregoing that if earnings are allowed on the present value, together with a surplus for annual replacements, the property is on the same footing with one which has established a depreciation fund by annuities and is allowed earnings on reproduction value.

If no depreciation fund has been established, it should be assumed that the earnings, which should have contributed to such a fund, have been spent in extra dividends to stockholders or used in additions and betterments, in either of which cases the result is that of a repayment of capital. It is accomplished in the former case by direct repayment and in the latter by increasing the reproduction value of the property without any capital outlay. Besides, the apparent loss in value of the property is very much reduced on any railway more than a few years old by the unearned increment of right-of-way values. The term, right of way, as used, includes real estate and terminal lands. The market value of such land is usually more than the amount originally paid for it, and, in the case of the earlier railways, many times more. With the value of the right of way equal to 20% of the total value, it is easily apparent that, in the case of the earlier railways, the unearned increment of right-of-way values might amount to more than 15% of the value of the property. This, with the appreciation of grading, would be sufficient to take care of the difference between reproduction and present values. There may be some railways of light traffic on which excess earnings in their early life and increase of right-of-way and terminal land values have not been sufficient to balance the depreciation. In such a case, the stockholders have simply made a poor investment.

Mr. Brinkley.

If provision is made by the railway company for replacements by a replacement fund of such an amount that it will be just wiped out in the years of heaviest replacements, then it would be equitable to allow the company net earnings sufficient for interest on the present value plus interest on the amount of the fund plus an annuity for the replacement fund. The same result would be achieved by allowing net earnings sufficient for interest on the present value, plus an annual payment into the replacement fund, no interest being allowed to accumulate in the replacement fund, being given to the stockholders instead for the use of their capital in the fund. As the sum of the present value and the amount of the fund will always approximate a constant value, the rates paid by the public should be the same general average through a group of years as if calculated on the basis of present value alone. Also, considering the fund as a part of the capital, no additions to capital account need be made for replacements as their cost will be taken out of the fund.

Depreciation is not a wastage of capital if its capital value is repaid, but, as far as the property is concerned, there is a diminution of value. If depreciation is a liability of the stockholders, earnings should only be allowed on the present value, for, if earnings are allowed on reproduction value, depreciation then becomes a liability of the rate-payers.

If earnings are allowed on reproduction value, and normal depreciation is treated as an element in the cost of operation that is covered by the rate, then, if no depreciation fund has been created, rates must be increased as depreciation takes place and replacements increase, since the reproduction value remains the same.

If there is no depreciation fund, and earnings are allowed on the reproduction value, then this becomes the selling value, as the latter is the capitalized value of the income. It has been agreed by the author, however, that the selling value or the capital invested by the purchaser should be based on the present value. It follows that earnings should be based on the present value instead of the reproduction value.

For property which has been allowed to deteriorate below the normal present value, it becomes a liability of the stockholders to place the structures in fair condition to the extent of the difference between the deteriorated value and the normal present value. In this case the stockholders should be penalized by a reduction of interest on investment sufficient to authorize this difference in values in a convenient length of time. During this time, the replacements necessary to bring the property up to normal condition, would be made. Earnings, insufficient in the past to take care of replacements, would be mitigating circumstances.

Mr. Brinkley.

The decision of the U. S. Supreme Court in the "Minnesota Rate Case" also covers thoroughly the question of right-of-way values. A quotation in part is as follows:

> "The company would certainly have no ground of complaint if it were allowed a value for these lands equal to the fair average market value of similar land in the vicinity, without additions by the use of multipliers, or otherwise, to cover hypothetical outlays. The allowances made for a conjectural cost of acquisition and consequential damages must be disapproved; and in this view we also think it was an error to add to the amount taken as the present value of the lands the further sums calculated on that value, which were embraced in the items of 'engineering, superintendence, legal expenses,' 'contingencies,' and 'interest during construction'."

This decision seems to be fair, both to the railways and to the rate-payers. The right-of-way values for the older railways will be much enhanced over the original cost, and it is not probable that the newer lines will suffer any hardship. The normal increase in land values, consisting of yards, terminals, and right of way, after a railway is built, is usually sufficient to provide for the extra cost of right of way over the market value at the time of construction. Some actual data, comparing original cost with present market value for land values of a complete railway system, would be interesting. However, it should be unnecessary to consider this question if we neglect original cost and consider only reproduction value. The present values of adjoining land have been created on account of the existence of the railway itself, and if the railway was to be built at the present time, the present land values would certainly not obtain. The only exception would be in case another railway existed in the same vicinity, which fact would also have influence in creating land values; but in any town certain land increases in value when another railway is built. Nothing can be known of what the land values would be if the railway did not exist. It seems to be expedient as well as good judgment under the circumstances to allow full market value and no more. The only other alternative is to give some consideration to original cost in the fixing of rates. A percentage for contingencies and interest during construction is evidently superfluous, as it has nothing to do with the present market value of the land.

The writer agrees that the ordinary method of calculating interest during construction is unfair to the company. By this method one-half of the total interest allowance for the time of construction is taken; two-thirds or three-fourths would probably be more nearly correct. If this is done, however, care should be taken that a too liberal allowance for time of construction is not made.

The author's views on depreciation are illuminating, especially on the subject of rails. In addition, it would be well to state that rail breakage should also be considered, and available statistics on this subject for each railway studied.

Mr. Brinkley.

It seems to the writer that depreciation in general should be handled only by an expert. The chiefs of ordinary field parties have not the experience and ability to judge accurately of the condition of structures, and the variations in their opinions are too great. In order to obtain the depreciated value, all structures should be examined by an expert and their condition noted. When the inspection is made, he should have the age of the structure, if such information is in existence. The percentage depreciation can be more intelligently noted if the age is known.

In view of this discussion, conclusions indicate that the recent Supreme Court decision in the Minnesota Rate Case, in regard to the basis for the valuation of railroads, is fair both to the railway companies and to the rate-payers. From the arguments and facts it does not seem possible that any other basis for rates than that of present value with right of way included at market value of adjoining lands, could be made without gross injustice.

Mr. Nicolaysen.

Albin G. Nicolaysen, Assoc. M. Am. Soc. C. E. (by letter).—The valuation of common carriers to be made by the Interstate Commerce Commission promises to be of such great importance both to the public and the railroads, and opinions as to the proper principles to be followed vary so greatly, that Mr. Wilgus' paper is most timely.

The author has given a clear presentation of his views, and the force of many of the arguments is admitted, but to the writer it seems that the railroads have generally received a little more than the benefit of the doubt. Thus it seems proper enough that some allowance should be made for solidification of embankments, but to advocate that such allowance shall equal the estimated cost of compacting the embankment as an earthern dam would be compacted at the time of its construction, does seem to be rather arbitrary. It is also certain that the surfaces of cuts become seasoned in time, so that the trouble from slides and filling of ditches is materially less in an old than in a new cut, and that the appreciation of the cuts may bear a close relation to the cost of maintaining the slopes from the time of construction until they become fairly stable; but the appreciation of the cuts is somewhat less, and not equal to the cost of maintaining them during the period of settlement, as some cleaning of ditches will always be required. However, where the difference between the two values is small, it seems to the writer to be reasonable and fair to give the railroads the benefit of the doubt, taking into account the fact that, in some cases, valuation for rate-making purposes may work hardship to innocent investors. The author, however, appears to claim that even an additional allowance, equal to the cost of establishing vegetation by artificial means, should

Mr. Nicolaysen. be made where the cuts have become covered with vegetation which protects the surface. This claim seems clearly against the fundamental principle that physical value is determined as the cost of reproducing the property in its present condition, under the assumption that the natural topographical conditions along the line are as they were at the time when the road was built, while, in other respects, the conditions are taken as they exist to-day; under this theory Nature may logically be assumed to re-establish vegetation in places where it has established such vegetation in the past.

It appears to the writer that most appraisers would make some allowance in the physical value for interest during construction, cost of promotion, banker's commission on securities (but not discount on bonds), contingencies, and similar items, so that the difference of opinion regarding these items would be confined mostly to the question of the proper allowance to make for each. This the writer does not consider himself qualified to discuss further than to state that it would seem reasonable to assume that an examination of the books of recently built roads would disclose data from which these items could be estimated quite closely.

There remains one fundamental question on which the writer differs absolutely with the author, namely, whether the proper physical value for rate-making purposes should be determined as the cost of reproduction new, or whether a deduction should be made from this value to cover depreciation.

As long as it is agreed that depreciation shall be included in maintenance, and that the renewals shall be charged as operating expenses, it seems clear that the physical value for rate-making purposes is the cost of reproduction new, less depreciation. To illustrate this contention it may be assumed that a certain road was built as a unit. When new, the physical value equalled the cost of reproduction new, since no depreciation had occurred. After the road had been in service for one year, a certain depreciation took place, but this depreciation was a part of the operating expenses for that year, and may be assumed to have been placed in a special depreciation fund. If this has been done regularly, there will exist at the present time a fund made up of yearly appropriations equal to the depreciation for each year less the cost of renewals made in the period considered, and this fund should equal the depreciation on the road as it exists to-day. The road under consideration is clearly entitled to a return on the cost of reproduction new without any deduction for depreciation, but the depreciation fund may logically be assumed to be invested in such a way as to earn interest on itself, and the net earnings from operation need only be large enough to provide for a return on intangible values, if any, and on the cost of reproduction new, less depreciation.

It is granted that such a fund is rarely established, but this does not alter the case; it simply means that the stockholders have drawn out of the road more than was really available for dividends, and have thus reduced their investments in the property by an amount equal to the depreciation. As long as the property is kept in good condition, no objection can be made to the withdrawal of money which, in a sense, belongs in a depreciation fund, because the average condition on a well-maintained road of any magnitude differs but little from year to year, and it will never be necessary, or even possible, to renew all of the property during one year. Mr. Nicolaysen.

If maintenance expenses are considered in connection with the return on physical value, it will be still clearer that depreciation should be subtracted from the cost of reproduction new, in order to determine the physical value on which a return may be expected. If this is not done, then two roads, A and B, for which the cost of reproduction is identical, will be entitled to the same return on their physical values, although A may be a fairly new road and in excellent condition, while B may be old and run down. Under such conditions the maintenance expenses, and, for that matter, the operating expenses too, would be far heavier on B than on A, and, as the roads are entitled to earn maintenance and operating expenses in addition to a return on the physical value, the result would be that the poor road, B, would be entitled to far larger earnings than the good road, A, which shows clearly enough that something is wrong with the basic assumptions. In fact, as the writer sees it, there is no doubt but that the physical value should be determined as the cost of reproduction new, less depreciation.

In connection with the question of depreciation, it would seem that average depreciation, rather than actual depreciation, should be used in the majority of cases. If an attempt was made to base the value for rate-making purposes partly on the actual depreciated value of the physical property, it would mean that the task of revising the valuation in order to keep it up to date would be almost impossible on account of the multitude of items involved. In addition, the writer believes that the result obtained by assuming that, say, all the untreated pine ties on a fairly large road had a present value equal to 50% of the value new, would be more nearly correct than that arising from an attempt to estimate the depreciation of each individual tie, although a still closer value might be obtained by estimating the average depreciation, bearing in mind that the normal depreciation would be 50% and the minimum and maximum depreciation, say, respectively, 35 and 65 per cent.

If average depreciation instead of actual depreciation was used to determine the physical value, the result would be a tendency toward stability in rates, field and office work would be greatly reduced, and the task of keeping the valuation up to date would be made practical.

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It is admitted, however, that the actual depreciation of buildings and structures should be determined, not only because it is required by law, but also because it will furnish a guide in establishing average depreciation of different classes of structures and in analyzing maintenance expenses, the writer's belief being that average maintenance expenses must be ascertained as a step necessary to the determination of intangible values, if any.

As, theoretically, abandoned property must be paid for out of the depreciation fund, it is obvious that such property as a spur to a mine which has been worked out, should only be given a nominal value. The same would necessarily apply to stretches of roads having such curvatures and grades as to make it impossible to operate trains economically over them under present conditions, to bridges which are too light to carry present rolling stock, etc. This, however, should be definitely settled and understood, else the natural result would be a postponement of a very large part of desirable improvement work along these lines, pending the completion of the valuation.

To the writer it seems that the value for taxation purposes may differ from that for rate-making purposes, but he is not certain that it would be impossible to distribute the several items of value between physical and intangible values in a way that is logical, and, at the same time, leaves the physical value the same, no matter for what purpose it is intended. If it were possible, this plan would be highly desirable as tending to give the valuations proper standing with the general public. It requires, however, that the method to be used in estimating the intangible values be determined, and it is greatly to be hoped that some member of the Society will present a paper dealing with this subject.

Mr. Molitor.

F. A. Molitor, M. Am. Soc. C. E. (by letter).—The thorough and masterly manner in which Mr. Wilgus has covered the subject of the physical valuation of railways has left little room for further discussion. As the writer's professional experience, however, has been confined solely to the building of railroads, a few points which occurred to him in reading this valuable contribution on the pressing subject now before the Interstate Commerce Commission and the railways may be of interest. It should be stated, however, that the writer's experience has been in the commercial or practical field, and not in the political or academic work of valuation for taxation or rate-making purposes; therefore, his views on the general subject may be biased.

Although the purpose of the Federal Act for the physical valuation of railroads is not stated specifically in that Act or elsewhere, nevertheless, it appears to be for one or both of the following purposes: (1) For rate-making or regulation purposes; (2) to ascertain the value of the railroad properties with a view of determining their present physical appraisement for the ultimate purpose of Government ownership.

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If either of these views is true, then the "original cost to date" is a mere bookkeeping task with the evident purpose of checking the results obtained by the engineering method of "cost of reproduction new" and "cost of reproduction less depreciation." The "sale method" may be dismissed from consideration, because, as Mr. Wilgus states, it can be used for taxation purposes only and hence is a State and hardly a Federal question.

Mr. Wilgus has stated the difficulties to be encountered in obtaining the "original cost to date," and an accountant or engineer may well shudder at the task of ascertaining in only the most general way the original cost of some of the earlier railroads, many of which have been rebuilt on entirely different alignment and right of way, the original roadbed having been obliterated by the elements and become a part of the landscape and topography. What possible value can such approximation of the original cost of a railroad, with additions and betterments and improvements added to date, be to the Federal Government? Or what standing will it have in Court? In fact, to what can an engineer consistently testify in the "original cost to date" except only what the books of the railroad company show?

It seems to the writer, therefore, that the only admissible method of valuation is the "cost of reproduction new" or "less depreciation," and he agrees with Mr. Wilgus' theory that the proper valuation for rate-making and regulation purposes is the cost of reproduction new, the depreciation, if any, being taken care of by the owners and stockholders as a liability. On the other hand, if the valuation is for the purpose of taking over and purchasing the railroad, then the depreciation should be considered only to the extent required in each railroad under consideration. It is at this point that the experienced railroad engineer may use his judgment. The writer is acquainted with many roads which are maintained in a first-class manner and would not in all fairness have any deduction for depreciation, because their general condition for the purpose of the public is as good as, if not better than, when it was new, as viewed and appraised in a broad and equitable light. Speaking academically, it is admitted, however, that each and every tie, panel, or track, or other detail of construction, is not new, and, therefore, from a percentage standpoint, is not "100 per cent. new." It is here that the fallacies of theoretical tables, based on the life of a construction detail or unit, and purporting to give its money value for each year of its life, are evident, when the railroad as a whole, or as an operating plant for the public benefit, is being considered.

Another railroad which by inspection shows a physical depreciation to the extent that repairs of roadbed, bridges, and buildings are required, may well have a "less depreciation" deducted from its repro-

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duction cost to the extent that the engineer may estimate, not, however, by counting the bad ties, but by estimating carefully what is required to place the road in proper condition in order to handle its particular traffic economically, and here it must be remembered that the traffic of the Pennsylvania Railroad requires a higher standard of roadbed efficiency than a short line in an outlying district with a light traffic density. Is this not an example of one of the "elements" entering into railroad valuation in respect to the "less depreciation" item? And is it not the point of view to be taken by the valuation engineer that he must apply different standards to different railroads? The writer can well imagine the inexperienced man acquainted only with the maintenance-of-way standards of the Pennsylvania Railroad, or other Eastern railway, being detailed to value some Southwestern line. Would he not unconsciously estimate his "depreciation" on an Eastern standard and thereby injure the Southwestern stockholders?

The writer has discussed the depreciation method because, since Mr. Wilgus' paper was published, the U. S. Supreme Court has ruled, in the Minnesota cases, that it must be considered, and although the writer has been of the opinion that it should rule only in roads under bad repair, we are now confronted with it in the valuation of the best roads, and it seems that, in considering depreciation broadly and having always in mind the traffic carried by each, and, in so doing, particularly avoiding formulas, we bring ourselves under the Supreme Court's decision.

Passing to the details of cost of "reproduction new," which must be first determined, regardless of depreciation, it seems to the writer that, in a general way, such cost can be estimated. It will be closer, perhaps, than an estimate of construction cost based on a careful final location, but, nevertheless, it is an estimate which, as far as graduation and masonry are concerned, is not nearly as close as the "final" estimate of the actually constructed roadbed. The masonry cannot always be reached to be measured. The excavations for foundations and classes of material thus encountered cannot be seen, and many like quantities of construction cannot be determined at all in the absence of plans and actual records of construction. On the more recently built railroads these may be found, but, to the writer's knowledge, no such records exist on many miles of lines, the construction staff having been dispensed with before the construction facts were recorded.

Sometimes the classification and overhaul of graduation quantities can only be estimated in the crudest possible manner. The fact that cuts are many years old prevents the most experienced eye from judging the original classification. Loose débris has slid down, covering the original roadbed walls, or weather has changed the character or classification of the visible material, giving hardly a hint of the classification of graduation originally moved, and no hint at all as to the quantities of classified material. In respect to overhaul, the original method of handling the work should be known. What sort of plant was used, whether scrapers, wagons, or cars. Here, again, the engineer, inexperienced with the locality to which he is detailed, may fall into error by assuming the use of a grading plant inconsistent with, and expensive for, the original work.

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The writer has mentioned some of the units of construction which cannot merely be inventoried or measured, but must be estimated, and, in consequence of which, the personal equation will enter into the valuation to a large degree, requiring eternal vigilance and care on the part of the valuation engineers, in order that their estimates may not be overthrown by the Courts on the testimony of the experienced and expert engineers of the railroad companies.

Referring to some units of construction which can be measured, engineers are sometimes confronted with the unit prices to be placed on them. Land values are the most important of these, and the writer is in agreement with Mr. Wilgus' expressions in respect to using a stated multiplier against the normal market value to determine generally the cost to the railroads, which is known to be in excess of other land purchases; he is compelled, however, to change the method, but not his original opinion, by the Supreme Court's ruling in the Minnesota Rate Case, where it decided against the use of a formula or factor for determining the cost of lands. This decision leaves only the alternative of using the normal present market value, but if abundant proof is offered of the actual amounts paid in good faith for land by the railroads, the writer cannot but believe that such costs of land will be admitted.

"Engineering," in the writer's opinion, has generally been estimated too low, and as far as his experience shows, has been varied from 5 to 10% of the cost of the railroad proper, depending on the locality and topography, as well as the speed at which construction progressed. In the case of a physical valuation, the construction must necessarily be assumed to have continued without interruption due to lack of funds or other causes, otherwise a wide door is opened for varied and excessive engineering expenses. It seems equitable, however, to make due allowance for such delays if they occurred during the construction of a particular railroad.

"Contingencies" is an item which, as Mr. Wilgus suggests, must be given due consideration, and is dependent on the individual cases presented in the railroad valuation.

Such minor items as insurance, stationery and printing, can be taken care of by a valuation engineer in no better manner than that suggested by Mr. Wilgus, but "law expenses" is an item that cannot readily be estimated by comparison with the like expenses of other rail-

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roads, because these expenses vary with each railroad and with the necessary legal work that was or should be performed in connection with railroad construction. As a general thing, the writer is of the opinion that law expenses have not heretofore been estimated as liberally as the facts and known expenses seem to warrant. Some railroads, through the selection of a contested route, or through contractors' difficulties, have experienced heavy charges for legal services during construction. When a railroad is valued for the cost of reproduction new, is it to be assumed that no legal difficulties of this nature had been encountered? If so, a just and equitable valuation for this item has not been made.

"Interest and Commissions," which cover the interest on the money invested in the railroad property presumably until such time as the railroad is completed, in operation, and becomes self-sustaining, and bankers' and underwriters' commissions, etc., are items susceptible of division of opinion and many interpretations, when placing a valuation on railroad property.

In the writer's opinion, a discount on bonds, as near as it may be determined by the probable credit of the railroad being valued, should unquestionably be allowed for, as it is part of the investing public's risk assumed in purchasing the securities of a new company, and the interest on which, therefore, should be paid for by the shipping public in the shape of the rates based on the total valuation of the railroad property, which should thus include the discount on the bonds. On one hand we have a small road with poor credit, the original construction bonds of which sold, say, at 60%, while on the other hand there is a subsidiary line of the Pennsylvania Railroad, for instance, the bonds of which, issued for construction purposes, would probably bring par to the investing public. In the consideration of the commissions and discount item in the valuation of these two extremes, should not this be taken into consideration to the extent of allowing no discount in the case of the Pennsylvania Railroad and 40% for discount to be added to the valuation to cover the legitimate risk taken by the investor in the small railroad company's bonds. The public thereby will pay a very small fraction of the interest on the 40% increase in valuation, in the shape of railroad rates. The only alternative would be that the public guarantee the interest on the bonds issued by the smaller company, so that by such additional credit they would bring par and a price equal to those issued by the larger railroad with its good credit.

The interest during construction, of course, is more readily obtainable by multiplying the estimated period of construction by the prevailing interest rate and dividing by the average period of time in which all the money was used, which, for practical purposes, has been taken as two, on the theory that the money expended during construction has been regularly distributed over that period, so that the average interest is one-half of the total amount. It is quite possible, on the other hand, that the money expended during construction has not been so evenly distributed as to permit of this course.

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A case is within the writer's experience where the graduation was comparatively light, heavy expenditures were made for right of way, and the rails and fastenings were shipped in the early stage of construction, with sight drafts against delivery, so that something like 75 or 80% of the cost of construction was expended in the early months. The remainder, consisting of bridges and buildings, was built after the track was laid, resulting in the fact that 25% of the payments were not actually made until 18 months after 75% of the expenditures were made.

It is believed, therefore, that there is a wide latitude in the consideration of the "interest and commission item" in which errors and omissions may enter, to the manifest injustice of the investing public, on the one hand, and the shippers, on the other, if rate-making and regulation is based on the valuation. The writer is aware that some authorities have questioned the allowance of interest and commissions in valuation at all. To those he would suggest that, in the establishment of unit prices for contract work of any character or in any locality, there is contained this very item which is a universal trade condition and must be recognized. The contractor is obliged to borrow money from his bank to carry on his contract work, as his monthly estimates are admittedly not sufficient to carry his investment for plant and like purposes during its earlier stages. He pays the highest rate of interest, and he is reimbursed for these interest payments in the shape of a percentage added in his unit prices. In many cases the contractor is obliged to pay commissions, and this is also reflected or added in his bid of unit prices made to the railroad company. Therefore, if the railroad company reimburses the contractor for interest and commissions, although they are hidden in the unit prices, why should not the railroad have added to its cost in the valuation of its property by the authorities the item of "interest and commission" as a transaction between the railroad and its banker instead of a transaction between the railroad company's contractor and his banker?

The writer is pointing out some of the items that have come under his experience in railroad construction, and have been practical ones, with the view of promoting further discussion on Mr. Wilgus' paper from those members of the Society who have had charge of or have been connected with State railroad valuation in the past, so that a broad light may be thrown on the subject for the benefit of those who are charged with the Federal valuation of railroad properties.

In the valuation of equipment, Mr. Wilgus suggests that each unit need not be viewed personally by the expert appraiser. Nevertheless,

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it would appear advisable for the appraiser to inspect as many of the units of equipment as it is physically possible for him to do.

The writer's theory is that equipment, motive power especially, is subject to heavy wear and depreciation not always in the ratio of its age, because one locomotive or car of an equal age and original construction may have performed a greater mileage, or may not have been maintained as well as another, and though he believes that depreciation of the roadbed and structures must be regarded in the general way as a single proposition, he feels that the equipment can, by actual inventory, be valued with the depreciation deducted and obtained in a careful and more exact manner. At the same time, the general overhauling and repairs made to equipment should be given the most careful consideration. Though the life of an engine may be taken at a given number of years, nevertheless, this life may be lengthened by systematic and careful general repairs and overhauling, which, in the case of many railroads, has been done. The past history of equipment is that it becomes obsolete rather than worn out. Its physical life is longer than its economic life, and it is not at all improbable that the latter should be taken into consideration in the value of equipment. That is to say, the unit value of a car of 100 000 lb. capacity is greater than one of 40 000 lb. capacity because of the greater operating efficiency of the former.

The writer is in the heartiest accord with Mr. Wilgus in giving due consideration and valuation to the preliminary organization expenses which are necessary incidents to the construction of any railroad. From the writer's knowledge, there have been instances in which these preliminary organization expenses have legitimately run into an amount equal to 20% of the cost of construction, and he believes that where a railroad company can show proof that such preliminary expenses have existed, they should be allowed in the valuation.

In conclusion, the writer recognizes the legal limitations within which much of the physical valuation of railroads has heretofore been undertaken by several of the States. He believes that though much of the information gained will be of value in the Federal valuation, nevertheless, there are many additional items which may well be taken into consideration by the Interstate Commerce Commission. He refers more particularly to the so-called intangible values. Some of the values that have been called intangible are not, in his opinion, at all intangible, and he will close by mentioning one very tangible item of the value of a railroad, with the hope of adding to the discussion further remarks on the subject.

The profile of a railroad has a tangible value and, therefore, should be considered in the physical valuation of any railroad property.

The economy of the operation of a railroad plant depends on a great many items, the principal ones being fuel, labor, and the profile. Labor rates are becoming practically uniform throughout the country, but the cost of fuel varies considerably. No item entering into the cost of railroad operation has a greater bearing on it than the profile, and, therefore, why should not the railroad, which, by advantages of location or by the efficiency shown in the location surveys in obtaining a lower grade line than another railroad, have this advantage expressed in the valuation?

The writer has knowledge of two railroads connecting two industrial centers. One of these has a grade line so much lower than the other that the "movement expenses" or cost of conducting transportation is not more than one-half that of the other road, not so wisely or fortunately situated. Should not the road of the lower gradient be given consideration in the valuation over the road of heavier grades? If valued for commercial purposes, the low-grade line would assuredly be valued higher than the railroad of a higher grade, because its net earning capacity is greater.

As the profile of the road is a physical feature, it would seem that a valuation could be placed thereon. The writer is not prepared to say at this time just how, but that some equitable basis could be arrived at for determining the profile value of a railroad is quite certain, and it is hoped that this subject at least will bring forth an answer from Mr. Wilgus.

The physical valuation of railroads now being undertaken by the Federal Government affords a great field for engineers in general, and for members of the American Society of Civil Engineers in particular, and it behooves them to study the problem carefully with the view of obtaining uniform methods and equitable results, and for such study no better text has been offered than the paper by Mr. Wilgus.

Mr. Gillette.

HALBERT P. GILLETTE, M. AM. SOC. C. E. (by letter).—Appraisers of railways and other public utilities differ radically on many important principles, such, for example, as to the propriety of using present unit prices or prices that are the weighted average during a term of years. The writer has found that most of these differences of opinion spring from differences in hypotheses as to the political status of public utilities. Analysis discloses two distinct hypotheses, or theories, which, though rarely reduced to words, exist in more or less definite form in the minds of appraisers. These two theories may be called:

1. The Agency Theory;
2. The Competitive Theory.

According to the Agency Theory, every public service company is a public agent authorized to render certain kinds of service, and entitled to be recouped for all reasonable expenditures and costs plus a fair profit.

Mr. Gillette. According to the Competitive Theory, every public service company is authorized to render certain kinds of service, and is entitled to collect what the traffic will bear under more or less competitive conditions.

It is needless, perhaps, to point out that, until recent years, American railways were not subjected to regulation according to the Agency Theory, but were "regulated" by the natural laws of commerce. Gradually, however, the Agency Theory of regulation has been evolving, but has not yet attained general application. We still see the Federal Government attempting to apply the Competitive Theory to railways, by forcing the dissolution of so-called "competing lines"; while, at the same time, the most "progressive" States are attempting to apply the Agency Theory. The Public Service Commission of the State of Washington recently authorized the consolidation of certain telephone companies, and scarcely was the consolidation effected before the Attorney General of the United States began action, under the Sherman law, to "unscramble" the consolidated companies.

Two political theories, therefore, are now struggling for supremacy; and it happens that these two theories vitally affect the principles to be applied in the appraisal of railways and other public utilities.

According to the Agency Theory, the "value" of a public utility property is the reasonable actual investment of capital in the property. This includes the investment in the physical property and the investment in the "residual development cost" (the unrecouped deficit in fair return on the investment).

According to the Competitive Theory (when logically applied), the value of the property is the cost of its reproduction at present prices, minus the capitalized difference in annual cost of production with the existing plant and with the most modern plant which would give the same service, plus the capitalized value of the profits derivable from the plant during the remainder of the company's franchise or charter. Briefly stated, this "value" is depreciated value plus franchise or going concern value.

Although there is a large element of injustice in suddenly dropping the Competitive Theory—a theory under which railways have so long operated and under which so many stockholders have invested—the recent history of public regulation makes it quite clear that the Agency Theory is destined to be adopted. In the transition period, however, we shall have a mixture of the two theories—a sort of compromise theory.

The State which has gone furthest toward the adoption of the Agency Theory is Wisconsin. We find the Wisconsin Commission, for example, including the "going value" or development cost (equal to the residual deficit in fair return) as a part of the total "value" for rate-making purposes. Also, it refuses to allow the cost of pavement laid over water pipes, unless the water company itself has paid for the pavement. Likewise, it averages unit prices over a term of years, and, where construction has been piecemeal, it uses piecemeal costs. Each of these four rulings is directly in accord with the Agency Theory, and directly opposed to rulings by some Commissions and Courts in other States where the Competitive Theory may be said to prevail.

Mr. Gillette. Mr. Wilgus gives powerful reasons favoring the use of cost of reproduction new as the "value" for rate-making purposes. The recent decision of the U. S. Supreme Court in the Minnesota Rate Case is adverse to this contention. The Court rules that depreciated value must be taken as the "value" for rate-making. Unfortunately, the railways involved in the Minnesota Rate Case presented their side so poorly that the Court did not have either adequate evidence or well-prepared argument on many vital points. Thus, there was no evidence as to the development cost of the railways. Again, depreciation was calculated by the State's engineer according to the "straight-line formula", and the railways did not have the acumen to put "the boot on the other foot" by demanding that an annual depreciation fund be calculated on the same basis. Had this been done, it would have been shown to the Court that the current maintenance expenditures were not sufficient to cover both the repairs of parts and the depreciation of entire plant units. Several other important errors were made by the railways in presenting their case, but these two are mentioned merely to indicate that the precedents established in the Minnesota Rate Case should not be taken as final by any means.

The author is entirely right in saying that depreciated value is not a rational basis for rate-making. Under the Agency Theory, a new public utility company starting to-day would be entitled to a fair return on its actual investment, and it would lead to "confusion worse confounded" were a part of that investment "written off" each year because of depreciation. The thing could be done, but no useful purpose would be served by doing it, while, on the contrary, rates of charge for service would fluctuate with an ever-changing depreciated value. There is a good deal of "horse-sense" in the illustration used by an attorney who argued that the price of milk is not a function of the age of the cow, growing less as the cow grows older, until it would be almost given away in the latter days of the cow's life. What the provident owner of a cow does is to charge a price for milk which will give a fair return on the investment (not on the depreciated value) plus enough to cover "operating expenses", including depreciation. Should the cow be purchased by another dairyman, it is true that he would pay for it on a depreciated basis, but the depreciated value would be such that, during the remainder of its life, the same

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price for milk would yield both a fair return on the lower price paid for the cow and enough to cover "operating expenses", including the remaining depreciation.

The Agency Theory applied to new railways will unquestionably lead to the use of the actual cost of the property as the rate-making basis, for it is not rational to burden the present, in order to relieve the future, patrons of the road, as would occur if depreciation were "written off" and rates were based on depreciated value. But what shall be said of the application of the Agency Theory to old railways which now, for the first time, come under the actual application of this theory? The writer believes that justice demands the most liberal treatment of public utilities, particularly in this transition period. Certainly, it is not liberal to appraise for rate-making any of the property of a railway at less than its cost new. Moreover, to use the depreciated value for old roads would be to apply a policy that would not be applied to new roads, in rate-making. Of course, it may be contended that the owners may thus be paid twice for accrued depreciation, because they have already taken out in dividends enough to yield a fair return plus enough to cover the accrued depreciation. Even were this so, we should not lose sight of the fact that the present owners were not the original owners; and they had no way of foreseeing the advent of this new theory—the Agency Theory. The writer, however, is confident that a careful analysis of the ledgers of all railway companies, as far back as accounting records are obtainable, will disclose that the residual development cost is sufficient to wipe out all accrued depreciation, and more too. Development cost is not, as commonly supposed, a matter of ancient history; for the truth is that almost every extension of a railway involves development cost (deficit in fair return). No sooner has the average railway "nosed out" of its development period than it makes an addition or improvement which plunges it into another development period, the surplus from the old investment being swallowed by the deficits of the new. Can there be any doubt, for example, that the great, new terminal of the Pennsylvania Railroad, in New York City, is a cause of deficit at present, in so far as that terminal is concerned?

This matter of development cost leads to another phase of the subject of appraisals. Mr. Wilgus says:

> "With rare exceptions, it is extremely doubtful that the books and records of the railroads of the United States will be found to be dependable for the purpose of ascertaining present-day fair values. Only in recent years have cost accounts been kept in a uniform and complete manner, and even then the almost universal tendency has been to understate charges to construction, and to additions and betterments."

The writer does not agree with the author, either that correct railway accounting is of recent origin or that the records are not dependable as a guide for appraisal purposes. He recognizes that old records are not always complete, but the gaps are surprisingly few in most cases, and not difficult to fill by estimates which cannot possibly alter the totals by very appreciable amounts. The railways of America would err seriously were they not to conduct the most thorough analysis of all their old records. Their first great error would be their failure to demonstrate what their development costs have been. Development cost (that is, deficit in fair return) cannot be proved satisfactorily except from accounting records. Their second great error would occur through failure to find all the elements of physical value created by necessary expenditures which cannot be seen with the eye. This, it may be said, can be covered by adequate allowance for "contingencies"; but, who knows what is adequate? The writer had occasion to appraise a large property which had been previously appraised by an engineer who had added 10% for contingencies, but whose appraisal still fell short, by 20%, of the actual cost of the property. Failure to hunt for and analyze the accounting records was at the bottom of this serious underestimate. The company was a consolidation of more than a dozen smaller companies, and the earliest accounting records were nearly 25 years old. Were the earliest of these records valueless in a present-day appraisal? Some, it is true, were of minor worth, but they covered minor elements of value. Nearly all the records served to throw light on elements of present-day value which, otherwise, would not have been discovered.

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In this connection, it may be added that the maintenance records should also be analyzed, for it is true, as the author says, that perfectly correct accounting has not invariably existed. Minor expenditures, which should have been charged to property account, have not infrequently been charged to maintenance, and the sum of these minor expenditures thus charged may be quite considerable. Conversely, abandoned or superseded property has not always been charged to maintenance, but occasionally has remained in the property account. This is particularly true of abandoned railway roadbed. A careful analysis of the construction and maintenance accounts, guided by the appraisal of physical property now visible, will result invariably in the discovery of values which otherwise would not appear in the appraisal. Not only will additional quantities be thus found, but larger unit prices will be deduced; and in this connection it may be well to add that unit prices should not be those obtained under rather favorable conditions, but under average conditions. A favorable condition, for example, would be "summer work". Winter work is an unfavorable condition, but one which is often imperative in railway construction, in order to keep down the interest and development cost. The history of the Northern Pacific extension to the Pacific Coast shows that at times

Mr. Gillette. almost as many men were engaged in shoveling snow as in shoveling earth. It was such conditions as this, coupled with other unforeseen difficulties, and followed by a much greater development cost (deficit in fair return) than was anticipated, which threw the Northern Pacific into bankruptcy not long after its completion to the Pacific Coast.

In recent appraisals made by the writer, it has been his practice to allow 5% for contingencies where the construction ledgers were all available, but where the original records of physical quantities were rather meager. If both ledgers and engineering records of quantities are fairly complete, the allowance for contingencies may safely be eliminated, provided liberal unit prices are used. It should be remembered that a contingency factor is automatically introduced whenever liberal prices are adopted.

Regarding brokerage fee, the writer agrees with the author in its inclusion as a part of the cost; but, of course, the same end may be obtained if the rate of fair return is made high enough to allow for all the discount on bonds, including the brokerage fee. This last view was that taken by the Washington Railroad Commission when the writer was its chief engineer, and it is the view now taken by most of the State commissions.

Interest during construction should certainly be calculated on all land as well as on other physical property. The writer was not in direct charge of the appraisal of the land for the Washington Railroad Commission, and, therefore, did not calculate any of the overhead charges on it. In fact, no overhead charges on the land appear in the final land values fixed by the Commission. It is possible that overhead costs on land were omitted, or else that they were included in the "right-of-way multiples". The writer calls attention to this particular case for two reasons: First, because he believes it to be a mistake not to put the entire appraisal of all railway property under the direction of the engineer in charge. Second, because the writer's total overhead charges on the plant, exclusive of land, have often been divided by the sum total of plant, inclusive of land, giving an erroneous result when taken to indicate the total percentage allowed by him for overhead charges. The author of one book on appraisals and many writers of articles have unwittingly been led into this error.

This is not the only kind of error which has been committed by writers in comparing the percentages for overhead costs allowed by different appraisers. For example, one appraiser may estimate 5% for business management, and another would include this item in the unit price and, therefore, not show business management as a separate overhead cost. Many railway construction contracts have been entered into with a managerial contractor on a "cost plus 5%" basis. The recorded contract prices are then sub-contract prices. An appraiser may either use these sub-contract prices and subsequently add 5% as a business management item among other overhead costs, or he may increase all the sub-contract prices by 5%, calling them contract prices, and show nothing separately for this business management. One needs to know the method used by an appraiser in arriving at his unit prices before one can interpret correctly his estimates of overhead costs. Not a few appraisers "bury" many of the overhead costs, leaving but a part to appear specifically as such in the final summary. The present practice of the writer is to show all overhead costs separately. They commonly total fully 25% of the cost of the "unloaded" property.

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As previously stated, the Washington Railroad Commission restricted its engineer to a consideration of plant value only, exclusive of land. Hence, working cash capital, brokerage fee, and development cost did not appear among the items estimated by the writer. The Commission listened to more or less testimony by the railways on "going concern value", etc., but announced its conclusions without stating any definite theory as to non-physical values. This failure to delegate to its engineer the study of all elements of value is one which the writer regrets exceedingly. The railways were equally mistaken in thinking that a determination of non-physical value was not an engineering problem; consequently, they did not make a satisfactory presentation of their case as to non-physical values. In all subsequent appraisals, the writer has insisted on having full charge of the entire appraisal, including determination of development cost, land values, analysis of accounting records, etc. Some one with technical training should always be placed in full control of any appraisal which is to be used as a basis for rate-making. If an example were needed to illustrate this point, it could be found in the Minnesota Rate Case, where the railway companies erred so seriously through not having the entire technical part of their case directed by engineers. The natural tendency of a railway company is to ask each department to prepare its part of the data, and the result is a more or less confused mass of facts—often facts which conflict because of their incompleteness or because of the incorrect use of terms. In the Minnesota Rate Case, both "right-of-way multiples" and "overhead charges" on land were thrown out by the U. S. Supreme Court. The inconsistent use of words and lack of proper definitions of terms account as much as anything for this erroneous ruling, for the Court was attempting to use symbols which it did not fully understand, and did not understand because they were not clearly and properly defined by any witness.

It would seem that attorneys would always see to it that at least the definitions of technical terms would be precise, and that witnesses would adhere to such definitions; but attorneys themselves are often lost when it comes to the use of engineering and other technical lan-

Mr. Gillette. guage; so that, if a technical rate case is to be presented properly to a commission or a Court, it should be presented by engineers and by those who have been taught by engineers to use technical terms properly and always with the same significance.

When railway appraisals first came to be used as a basis for rate regulation, all, except engineers, regarded an appraisal as being somewhat analogous to a merchant's inventory of stock on hand—a very simple, though often laborious, process. Gradually it has become evident, even to non-technical men, that an appraisal for rate-making purposes is exceedingly technical and complex. When it is realized, also, that rate-making based on cost is even more technical than appraising a property, we shall have an end to the "hot air" testimony of rate experts who are experts only in fixing rates "as high as the traffic will bear."

Appraisal and rate engineering has already become one of the many branches of engineering. The engineering specialist in this line should be primarily a logician, skilled in the use of language and in the science of reasoning. He should be thoroughly acquainted with the general principles of economics and particularly with the principles of engineering economics. He should be well informed as to the decisions of State and Federal rate-regulating commissions, as well as Court decisions bearing on valuations and rates. He should be personally acquainted with specialists in many lines, so that he may select men competent to give any desired information. He should be thoroughly grounded, not only in the principles of accounting, but in the mechanical details of public utility accounting. He should be an incessant student of the new phases of his specialty and of unit costs of construction and operation. Executive ability is also essential to him, but need not be of as high an order as that required of one who is constantly directing large enterprises. It is needless, perhaps, to add that his character should be such that he would make an impartial judge. Obviously, no man can attain the ideal in this, or in any other, branch of engineering; but, at least, those who employ appraisal and rate engineers should aim to secure men who are idealists rather than opportunists, for this is not a profession where mere advocates will survive.

Mr. Willoughby. J. E. Willoughby, M. Am. Soc. C. E. (by letter).—The writer is in accord with Mr. Wilgus in his conclusion "that the cost of reproduction new appears to be the only measure of physical value that places all railroads on the same plane, and the only one that provides for the inclusion of every element of cost that enters into the creation of a going railroad," but cannot agree that he has taken the correct view of depreciation.

Mr. Willoughby It is true that in a well-maintained railroad the accrued depreciation in track and structures does not lessen its capacity as a carrier to perform the work for which it was created, nevertheless, the monetary value of a railroad with track and structures representing 55% of the service that would be obtained from a railroad with all its parts new (all other conditions being unchanged), is less by the amount of the depreciation. Of the capital originally placed in the track and structures, 45% has been consumed. The replacement of this capital can be effected practically only by the creation of a depreciation accounting with a credit which at all times will be equal to the accrued depreciation. The depreciation fund is properly accumulated from year to year as an operating expense, and is to be regarded as an item of value (just as working capital is) which enters into the total value of the railway property whether that value is being ascertained for the purposes of sale or of rate-making. The value of the physical features of any railway property at any time is:

The total cost of reproduction new, less the accrued depreciation on those parts so affected, plus the accrued appreciation on those parts so affected, plus the amount of the fund provided for the renewal of the parts on which depreciation has accrued.

In many of the existing railways a depreciation fund, if set up now in the accounting, would cause to be shown a profit and loss deficit which would properly reflect itself in a deduction from the market value of the stocks. The meaning would be that, in the past years of the railway's operation, a definite portion of the capital originally put into the track and structures has been consumed instead of being charged out annually as an operating expense. Certainly, the same arguments which caused a depreciation accounting to be set up for rolling stock, apply to the track and structures.

It has been advocated that inasmuch as the annual repairs and renewals, a part of the annual operating expenses, are sufficient to replace the amount of the annual depreciation, a depreciation accounting is useless. Such a view ignores the capital consumed during the early years of the railroad's operation, when the annual repairs and renewals did not replace the annual depreciation.

There is unanimity of opinion that the accrued appreciation in the roadway and right of way should be taken into consideration in fixing the cost of reproduction new. When that is done, it is proper to consider also the depreciation.

The writer believes that obsolescence should be considered as a form of depreciation, because depreciation, in the sense used in connection with the re-valuation work, covers any deterioration of the part affected from any cause by which that part has a less capacity to perform the work for which it was created.

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S. Whinery, M. Am. Soc. C. E. (by letter).—The author refers to the widely different opinions and practices of engineers, appraisers, and the Courts in the valuation of land used for right-of-way and other railroad purposes. Such differences are doubtless largely due to the fact that the purpose for which an appraisal is made controls the point of view to a greater extent than in any other class of railroad property. This fact seems not to have been generally recognized and given proper weight in appraisals and in discussions of the subject, particularly by the public.

The importance of the fact that the purpose for which an appraisal is made must control the methods and values used, was early impressed on the Commission appointed in 1909 to re-appraise the railroads and canals of the State of New Jersey.

The Joint Resolution under which the work was undertaken, required that the Commission should prepare and report a "true and complete inventory and appraisal of the true value" of the railroad and canal property of the State, and, further, though rather incidentally, stipulated that the valuation "shall be in a form available for the purpose of taxation under existing laws".

In their first (progress) report, the Commissioners stated:

> "It is not positively stated in the Joint Resolution that the valuation is to be solely for taxation purposes. A true and complete inventory and appraisal of value seems to be called for regardless of the purpose for which the valuation is made. But the term 'True Value' is not definite, since the value of any property varies with the standard of value applied and the point of view from which it is judged. From the very nature of railroad property and the manner in which it is held its market value, in the sense in which that term is applied to other property, is difficult to determine. The commercial value of a railroad is usually determined by its net earnings and the returns made to its owners, quite independent of its cost or of the value of the property it possesses. Frequently there appears to be no close relation between the cost of a railroad and its commercial value. Valuations for the purpose of fixing rates, or for determining proper rental, or terms for joint running operation may also be quite apart from the commercial or the intrinsic value. The value of the franchises and the other intangible property of a railroad may be differently appraised according to the purpose of, or the point of view from which the appraisement is made. Finally, the value of this class of property for taxation purposes may be quite different from any of those named above. It seems, therefore, impracticable to apply any single valuation of the railroad and canal property of the State to more than one specific use, and if this be true, it follows that the purpose of the valuation should be determined upon before an appraisal is made.
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> "In view of all these conditions, and after a careful consideration of the Joint Resolution, and in view of the necessity of establishing the particular kind of value we are called upon to determine, your Board has thought it best to appraise the various railroad and canal properties from the viewpoint of the use of the appraisal mainly for the purposes of taxation."

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From the wording of the Resolution, it may fairly be inferred that although the members of the Legislature had in mind the use of the valuation chiefly for purposes of taxation, they were under the impression that the phrase, "a true and complete inventory and appraisal of the true value of railroad property", could be applied to any purpose for which the value of the railroad and canal property of the State might be needed.

There is abundant evidence that the same idea is held by a majority of the public, including members of Legislatures and of Congress. It is important for many reasons that the public mind should be disabused of such erroneous conceptions, and it should be one aim of public discussions of the subject to educate the public on this point.

In fact, there is great need that the public should be educated on the whole subject of the valuation of quasi-public property, and for this reason it would be well that technical discussions of the subject should be sufficiently elementary, and couched in such language that any intelligent citizen could read them understandingly; and that a greater effort should be made to give these discussions as much publicity as possible.

The question of the proper valuation of railroad real estate is complicated and made more difficult by the widely varying elements which enter into the original cost of the property and the conditions under which it was acquired and is held by the railroads. These elements are of such character and of such magnitude that the ordinary standards of fair market price are usually only partly applicable in determining the value of the right of way, either at the time it is acquired or later. Even where the cost of the property to the railroad is ascertainable, it is not always a correct basis of valuation for some of the purposes for which an appraisal may be required.

In discussing the subject, it is the purpose of the writer to deal chiefly with broad general principles, but to consider these somewhat more in detail than has been usual, and to review the various elements of cost and value that enter into an appraisal, for any specific purpose, of right-of-way land. It seems to be necessary, in the interest of clear statement and argument, to recount facts and principles which are neither new nor novel, and the discussion, therefore, may be somewhat tedious to the reader. The writer will attempt to deal with the matter from what he conceives to be a sound and reasonable business standpoint, with little reference to statutes and Court decisions, which may vary in different States. In any specific case, the laws and Court rulings controlling in that locality must, of course, be complied with, Mr. Whinery. but sound principles of justice and equity must be the fundamental basis of all appraisal work.

What will be said refers more particularly to right of way proper, rather than to lands acquired and held by railroads for terminals and other improvements. The status and basis of valuation of these latter may, and usually do, require special consideration and treatment.

Right-of-way land is held by the railroads under one of two forms of tenure: ownership in fee simple, or some form of easement. In the former, absolute title to the property is conveyed to the railroad; in the latter, only certain rights to occupy and use the property for a specified time or purpose are acquired. The distinction is clear enough in theory, but not always in practice. A conveyance in fee simple may contain conditions, as a part of the consideration, which may cause the property to revert to the grantor, or which may be a continual menace to the title to the extent that it amounts to little more than an easement; and an unconditioned, perpetual easement may be equivalent, for practical purposes, to ownership in fee simple. The tenure under which the land is held by the railroad, therefore, is a matter to be given due weight in its appraisal; but, for the purposes of outlining general principles in this discussion, it will be sufficient to consider only right-of-way land owned in fee simple by the railroad.

Into the consideration, or price paid for a typical right of way, however that price may be determined, three principal elements usually enter:

1. The fair market value of the land.
2. Permanent damages to the remaining property from which the right of way is severed.
3. Temporary damages.

To the sum of these items must be added, to find the actual cost to the railroad:

4. Expenses incidental to the acquirement of the property.

Permanent damages are such as permanently impair the value of the property, a part of which is taken, for the uses to which it is, at the time of the transaction or may be in the future, devoted. The cutting of a farm into two parts, separated by a railroad, involving permanent inconvenience, danger, and increased cost of improvements and of operation, interference with drainage, or with satisfactory sub-division, is an illustration of permanent damage. Temporary damages are such as entail the expenditure of money or cause temporary inconvenience and loss, but do not of themselves impair the present or future fair market value of the remaining property. The cost of moving a building located on the right of way to a new site where its value, convenience, and usefulness to the owner are not decreased, or the cost of removing or rebuilding fences and other improvements, are fair illustrations of temporary damages.

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While these elements of market value, permanent and temporary damages, may not be itemized separately in the settlement or award, it is safe to say that they enter into the aggregate consideration paid for nearly every right of way acquired. The necessity for recognizing and distinguishing between them in some appraisals will appear subsequently in this discussion.

The fourth element, incidental expenses incurred in obtaining a right of way through a property, is as truly a part of the actual cost to the railroad as the nominal price paid to the owner. This would seem to be such an obvious fact as to require no argument, and yet it has been denied or ignored in some Court decisions and in a number of appraisals of cost of reproduction. It includes such items as cost of conferences and negotiations, legal services, cost of condemnation proceedings, etc.

The compensation or consideration paid for a right of way is determined either by mutual agreement or by the award of a theoretically disinterested body of men, on the evidence presented, in the judicial procedure known as condemnation. In case of settlement by mutual agreement between the railroad and the owner of the property, the amount of consideration may vary nominally from zero (donation) to any figure which the railroad may be willing to pay and the owner to accept. The compensation thus agreed on, however, cannot always be taken as a just measure of the cost or value of the property transferred. There may be other valid considerations, which may or may not be named in the deed, but, whatever they are, they do not affect the actual value and, generally, not the ultimate cost of the property to the railroad or its appraisal value for some purposes. This is true even where the right of way is donated. If one friend is good enough to donate to another $1 000 to be used in establishing a new business, and the money is thus used, it becomes, legally and morally, as truly a part of the latter's invested capital as the money supplied by himself. As a matter of fact, however, a donation of right of way is practically almost never a donation except in name. The so-called donor expects to, and usually does, in some way, get value received, and the railroad pays a price, usually in the form of supplying service for a time at a loss, due to the building and operating of its road in advance of the time when the developed business becomes sufficient to yield adequate returns. It may safely be asserted that in such mutual settlement a fair and proper consideration passes, directly or indirectly, between the grantee and grantor, and that the full value or ordinary cost of the donated right of way should be reckoned as a part of the money invested in the road.

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On the other hand, if the railroad agrees or is compelled to pay an exorbitant price for the right of way, it must be assumed, unless fraud or gross misconduct can be shown, that the money so paid represents as truly a part of the legitimate and necessary cost of the road as though it had been expended for rails and cross-ties. This is true whether the sum paid was a reasonable price for the property or included excessive actual or alleged damages, or was consented to by the railroad to avoid delay or litigation. Where the right of way is secured by condemnation, the theory is, and the fact must be assumed, that the compensation awarded was determined by a body of competent and disinterested men after weighing all the facts, and that the sum awarded was fair and just, and is, therefore, a proper charge against the cost of the road and a like credit to its capital account.

An appraisal of the value of the physical property of a railroad may be undertaken for a number of purposes, among which may be named:

1. To ascertain the cost of the railroad for the purpose of determining the reasonableness of its capitalization;
2. To ascertain the value or cost of the railroad property as an element in the determination of proper and reasonable rates;
3. To determine the value of the property preliminary to a prospective purchase or sale of the railroad;
4. To ascertain the value of the railroad property for the purposes of taxation.

Confining the discussion to right of way and real estate, we may consider the principles and practice that should control in an appraisal for each of these purposes, or cases.

Case 1.—Appraisals to Determine the Reasonableness of Capitalization.—The word "capital" is variously defined. Applied to railroads, it is generally understood to mean the amount of outstanding evidences of cost or debt in the form of stock and bonds. The scientific as well as the ordinary and common-sense definition, however, is that capital is the amount of money permanently invested in a business, and the word is used in that sense in this discussion. It is a reasonable proposition that the evidences of indebtedness of an enterprise—stocks and bonds—should not much exceed the amount of money actually invested in the business, which, in the case of a railroad, may be defined as the amount of money expended originally in its organization, financing, construction, and equipment, plus the amounts since expended in additions and betterments, plus a reasonable amount of free money required for conducting the business, commonly called working capital; and the object of an appraisal, with reference to capitalization, is to determine whether such equality exists.

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From this point of view, the question of capitalization is essentially one for the accountant rather than the appraiser. Under usual or normal conditions, neither the present reproduction cost nor the market value of the property can be relied on to disclose the amount of capital which has been actually and legitimately invested in the railroad. Thus, it is possible to conceive of two roads which, to-day, are identical in every respect. One of them, however, was built a generation ago and the other quite recently. When the first was built, the prices of construction work and equipment were materially lower than when the second was built, and the capitalization of the latter will necessarily be correspondingly higher. It would be obviously unjust to assume, because their property now inventories the same, that the younger road is over-capitalized.

The real question to be answered is: What amount of money has been, and, therefore, is now, actually invested in the property? In other words, it is a question of cost and not of present value. The principle is here stated in its broadest terms, and certain reservations must be kept in mind. The permanent destruction or abandonment of property, the payment of dividends out of capital or out of earnings necessary to maintain the property in normal condition, and other like practices which are, if not dishonest, violations of sound business principles, may impair the capital, and if found to exist, must be taken into consideration. On the other hand, the retirement of bonds by paying them off, though it may reduce the outstanding evidences of indebtedness, commonly called capitalization, does not decrease the actual capital or money invested in the road.

Unfortunately, correct and adequate accounts of expenditures chargeable to capital account from the beginning are usually not available. Either they are wholly absent for early periods, or are incomplete, or have not been kept in such a way as to distinguish clearly between betterments on the one hand and maintenance and operation on the other, and it is impossible to determine from them the true investment cost. The very common practice of charging extensive betterments to cost of operation or maintenance, which has prevailed to a large extent in the past, is a pertinent illustration of this condition.

In the absence of complete and trustworthy accounts, an appraisal of the property may be resorted to as the best way to ascertain an approximate estimate of the amount of money invested, or, in other words, the reasonable capitalization.

If the principles here laid down are sound, it must be obvious that an appraisal for this purpose should aim to disclose the actual cost of the property and not its present reproductive cost or marketable value. An inventory of existing property is, of course, necessary, but the unit prices applied to determine aggregate value should be those of

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original cost and cost of betterments at the time they were made. Neither depreciation nor appreciation of original values has any proper place in such an appraisal, unless it appears that the capital has been impaired by some of the actions or causes already mentioned.

The depreciation of the property by ordinary causes (excluding those named which obviously impair the capital) does not decrease the amount of money invested, nor does it ordinarily decrease the capacity of the property for rendering service, as long as the property is kept in reasonable operating repair. A locomotive, for instance, may be ten years old, and yet be as capable of efficient and economical service for the work required of it as when it was new. Even when so worn out as to be incapable of satisfactory service, it will be replaced by a new one, which, if purchased at the same price as the old one, will neither increase nor decrease a properly kept capital account. Nor will any depreciated value assigned to it at any time affect the amount of money invested, on which interest and dividend charges must be paid.

On the other hand, any appreciation of the value of a property, by causes other than the actual investment of additional capital, does not affect the capital account. It is a so-called unearned increment which properly belongs in a surplus rather than a capital account. Nor should earning capacity represented by the market price of stocks or bonds be given any weight.

Applying these principles to the appraisal of right of way and real estate, it follows that the object should be to ascertain and use values which represent the actual cost of the property to the railroad. In such an estimate of the value of right of way all the elements which go to make up the total cost, fair market value, permanent and temporary damages, and incidental expenses, should be reckoned and included. Practically, this may ordinarily be accomplished most satisfactorily by applying a properly determined ratio or multiplier to the fair local market value of similar land at the time the property was acquired. Usually, sufficient records of actual cases will be available to establish, with reasonably close approximation, the value of the multiplier to be used. This matter will be considered more at length under Case 4.

Case 2.—An appraisal made for the purpose of establishing or regulating rates should be governed by the same general principles and methods as one made to determine the reasonableness of capitalization. In fact, their ultimate object and uses are substantially the same.

The lowest rates which a railroad may reasonably or legally be required to charge are such as will repay the total cost of the service rendered, including interest charges and a fair return on the money invested, as any lower rates would be confiscatory. Interest and dividends are a part of that total cost, and as they are functions of the capital invested, the latter must be known in order to determine legitimate cost and to frame proper rates.

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This is the only logical theory on which an appraisal of physical property can be called for or utilized as a basis for regulating rates, and, therefore, an appraisal for this purpose should disclose the amount actually invested, as in Case 1. This applies to right of way and real estate as well as to other property.

It is true that enhanced value of real estate may increase the amount of taxes assessed against and collected from the railroad company; but, in the usual method of railroad accounting, taxes paid are treated as an item of expense separate from and independent of interest and dividends, and do not, therefore, affect the capital account.

Case 3.—An appraisal made for the purpose of determining the value of railroad property in a contemplated purchase or sale will necessarily differ in many respects from one made for the purposes named in Cases 1 and 2, and the character of the appraisal will vary with the nature and circumstances of the proposed transaction. When the proposed sale is by mutual agreement between parties equally disposed and free to deal, the appraisal is essentially equivalent to the ordinary invoice of industrial or commercial concerns. In other words, its purpose is, chiefly, to disclose market value. Such transactions are mostly between private parties, do not concern the public, and need not be considered here. But where a Government elects to acquire property by the exercise of its power of eminent domain or other coercive processes, regardless of the owner's desire or willingness to sell, the situation is wholly different. If the owner is to be deprived of his property, he is entitled to full and even liberal compensation therefor. This applies, not only to the naked value of the physical property, but to franchise rights and other intangible values, and to any special physical conditions which may make the property especially remunerative. For from any sound business standpoint, present and prospective earning capacity is more truly a measure of value than the cost of the property or its physical value, and is as much a real asset as physical value. Therefore, the guiding principle in an appraisal of the property should be to ascertain its present and prospective productive value, of which original cost or cost of production will be only one element.

The soundness of these views will hardly be questioned in the case of the property of any private person or corporation whose title to the property is clear, equitable, legal, and untainted by fraud. It does not matter when or how such a sound title was acquired, nor whether the property would be of equal, or in fact, of any, value to the purchaser.

In the case of railroads and other quasi-public corporations, created and existing under governmental permission or franchise, however, the title is clouded by stated or implied reservations embodied in the franchises, and this fact must be taken into consideration.

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These franchise reservations, it is true, do not confer any rights to ownership or title. The right and power to expropriate the property of private owners without their consent are derived from a different and wholly independent source—the doctrine of eminent domain, which may be exercised in any case for the public good. The rights and powers of Government derived from franchise grants do not usually extend beyond a certain degree of control or regulation for the public good. It is claimed by the legislative, and affirmed by judicial, authority that the Government may intervene in the operation of a quasi-public corporation to the extent of requiring satisfactory service for reasonable charges; but the question, what are reasonable charges, is still an open one. In fact, it is one which is very difficult to decide, not only in a general way, but as to any particular case. It will be conceded by nearly all fair-minded people that, where the service is inadequate and rates are not only oppressive to the public but yield excessive profits to the owners, it is not only the right but the duty of the Government to intervene and to establish relations between the two which will be fair and just, with due regard to the rights of each. It seems to be widely held that reasonable charges are only such as will repay the cost of the service and yield a fair return on the capital actually invested; and fair return is defined to mean little if any more that the prevailing rate of interest. This theory does not recognize intangible property, such as productive value, and, if enforced, might greatly depreciate any value of the property based on its special earning capacity.

The combination, in the hands of the Government, of the franchise right to control, and the eminent domain power to expropriate, property, unless wisely administered, may be a very dangerous one. If a quasi-public enterprise may be forced to extend its service and reduce its rates to such an extent as to cripple its earning capacity and thus to reduce greatly its commercial value, and the Government may, later, seize or condemn the property at the reduced value created by its own acts, the result may be as truly confiscatory as if physical property were taken without compensation to the owner. It is true that the National Constitution prohibits the taking of private property without due compensation; but it is silent on the question as to what constitutes due compensation. This question must be answered ultimately by the Courts. Thus far it has not been answered conclusively and fully as to the intangible values of quasi-public corporations; and until it shall be so answered, the question of a proper appraisal of such properties for the purpose of an enforced sale cannot be decided definitely. There are hopeful indications that the broad ground may be taken and sustained that productive value, in whatever form it may be found, whether physical or intangible, shall be given proper consideration in such appraisals.

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In the present unsettled condition of many questions of detail, it is most important that an appraisal of this character should be thoroughly and intelligently considered by the authority ordering it, and that definite instructions as to the principles which shall control it be given to the appraiser, who must then be wholly governed thereby.

Assuming that the owner is entitled to compensation on the basis of a reasonable regard for the productive value or earning capacity of his property, as well as for its physical value, the general principles outlined apply with special force to the appraisal of right of way.

While a country is new and unimproved, a right of way may have been acquired at a very small cost. Not only was the market value of the land very low, but the conditions were such that both temporary and permanent damages were almost negligible; but, to secure an equally good right of way through the same locality after the lapse of 15 or 20 years, when the country has become thickly settled and costly improvements have been made, would be a difficult matter involving great cost. Not only will the market value of the naked land have greatly increased, but numerous and costly improvements will be encountered which will warrant heavy damages. In such a case it would be fair to say that, other things being equal, the old existing right of way is physically worth what a new one in the same vicinity would cost. In addition to this physical value, the existing right of way may possess strategical advantages and facilities for doing business which it would be impossible for the new one to acquire, and, if so, due consideration should be given to the value of these elements.

There are no present indications that either the National or the State Governments seriously contemplate the purchase of the railroads. Nevertheless, it is well to call early attention to the fact that an appraisal for some other purpose, as for regulating rates, cannot justly be used for determining values in expropriation of the properties.

Case 4.—Where the object of an appraisal is to determine the value of railroad property for the purpose of assessing ordinary taxes, the principles and practice appropriate will differ materially from those applying to the other cases considered. This is especially true with regard to right-of-way land. Unless otherwise provided by State statutes, railway land is subject to the same rate of taxation as other lands, and the amount of taxes assessed depends on the valuation placed on the land by the assessors. This assessed value of land may not be, and in fact usually is not, the same as the market value. The ratio between the two values, however, is presumed to be applied to all lands alike. In other words, the assessed value for taxation is rela-

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tive rather than actual. An appraisal of right-of-way land for taxation purposes, therefore, should be based on the assessed valuation of similar land adjoining it or in its vicinity. This does not mean, however, that it should be valued at the same unit price as such adjoining land, but rather that its actual value, when determined, should be multiplied by the ratio between the actual and assessed values which may be found to prevail in the locality. In determining value for taxation, the Courts have generally made it plain that neither the use made of, nor the amount of benefit or profit derived from, the land may be considered.

The question to be decided is, therefore: What is the value, other things being equal, of right-of-way land as compared with that of other land in its vicinity?

In seeking a general answer to this question, it may simplify the discussion to use for illustration a hypothetical case which is fairly typical of a majority of right-of-way transactions.

A owns a farm of 160 acres, the fair and reasonable market value of which, as a whole, and of similar land in the vicinity, is adjudged to be $50 per acre. For simplicity, it will be assumed that it is taxed on this full value. Through this farm a new railroad must secure a right of way, 100 ft. wide, requiring, say, 6 acres. The conditions are such that the three elements, fair market value, permanent damages, and temporary damages, are involved. It will be assumed that the parties cannot agree on the amount of compensation to be paid by the railroad, and that the right of way is condemned by a commission of disinterested, competent, and fair-minded men, who exercise their best judgment, after informing themselves of all the facts. They find and report that the market value of the land is $60 per acre, that the permanent damage is $600 and that the temporary damage is $140, making in all $1 100. The question at once arises, why do they estimate the value of the 6 acres taken, at a higher price per acre than the admitted fair price for the whole farm; and is that action justified? It may be replied, that though it may be true that the severed land is intrinsically no more valuable than that which remains, common business customs sanction the higher valuation. The general analogy to wholesale and retail transactions may be instanced; also the familiar fact that when a tract of land is purchased *en bloc* and divided into smaller tracts or lots, these latter command a higher unit price than was paid for the whole tract. Again, fair market price is said to be that price established when both seller and buyer are equally free and disposed to deal. Now, if for any reason, B wanted to buy a selected part of A's farm, which is intrinsically worth no more than any other part of the farm, and is located so that its severance would not damage the remainder, it

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is natural and reasonable that A should ask, and B should be willing to pay, a higher unit price than A would ask for the farm as a whole. It is equally reasonable that the land severed for the right of way should command a higher price than the farm as a whole. What that higher price should be is a matter of judgment, and it must be assumed that the commission exercised its best judgment in the matter. It must be assumed that its award for permanent and temporary damages is also fair and equitable.

The transaction being closed in accordance with the award, the question in due time will arise, how shall the properties be assessed for taxation? Here, the State becomes an interested party, and her rights must be taken into account. The permanent damage of $600 was awarded on the ground that the remainder of A's farm is permanently injured and, therefore, that its value is decreased by that sum. When the tax assessor appears, A may reasonably claim that that sum shall be deducted from what his farm would otherwise be assessed for. The assessor accedes to what seems a just demand, and appraises the remaining 154 acres at $46.10 per acre, and proceeds to appraise the railroad right of way. Here some perplexing questions arise. He may readily decide that the property should be appraised on the value fixed by the Commission, but he discovers that even when this is done, the aggregate assessment on the whole of the property will fall short of the amount the undivided property has been previously appraised at by $540.60. In other words, that on such an appraisal, the State will lose the taxes on that sum. This would obviously be unjust to the State. Further study shows him that in order that the State shall receive the same amount of taxes as before, the permanent damages deducted from A's appraisal must be practically all added to what would otherwise be the appraised value of the right of way. In other words, permanent damages must be considered as accruing to the benefit and value of the severed land, in addition to what would otherwise be its fair market value. He, therefore, lists the right of way at $\$360 + \$600 = \$960$, or at the rate of $160 per acre, and, under these appraisals, the State will receive substantially the same amount of taxes as heretofore. The value per acre thus ascertained is 3⅕ times that of other land in the vicinity.

The ordinary tax assessor may not enter into such nice reasoning or computation, or reach a like result, but he might well do so, and the soundness of the argument, from the State's point of view, must be conceded.

The conditions described relate to a time closely following the acquirement of the right of way. The question arises whether the conditions then found continue into the future, say, 20 years thereafter. The market value of surrounding land may have increased or decreased

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in the meantime, and the naked value of the right-of-way land may have increased or decreased accordingly. The award for permanent damages, however, does not change with time. The injuries to the remaining land, from their very nature, must be regarded as permanent and continuous, and their value must still inhere in the right-of-way land. It is, therefore, still a factor to be reckoned with in appraising the property for taxation purposes.

Coming now to the application of these general principles, it would appear that a proper appraisal of right-of-way land for taxation purposes should be based on at least three elements of value:

First. The fair market value of similar land in the immediate vicinity (excluding, however, adjoining land permanently damaged);
Second. A reasonable percentage to be added for increased value due to selection and severance;
Third. The amount of the permanent damages caused by the taking of the right of way.

If in any given case the records of the original transaction were available and the compensation paid were properly itemized, it would not be difficult to arrive at a proper valuation; but, in practice, especially in the case of the older railroads, these data are hardly ever available, and the appraiser must exercise his best judgment, particularly as to the fair amount of the permanent damages.

In fact, it is found in practice that it is hardly practicable or even possible to consider each individual tract of a right of way thus in detail, and that it is necessary and desirable to formulate some general rule to be applied to the determination of the value of right-of-way land, either as a whole or to certain classes or local sections. This is the more permissible because the right-of-way land of any railroad is likely to be assessed as a whole, and a correctly framed scale of values is likely to give fair average results.

The simplest and, perhaps, on the whole, the best procedure is to assume that the value of the right-of-way land bears some fixed relation to the market value of other lands in its vicinity, and to apply some fixed multiplier of that market value to the right of way. Multipliers varying from one to three have been used in different appraisals, where the purpose of the appraisal has not been clearly defined.

The author states that it is a well-known fact that land for right of way usually costs from 2 to 2½ times as much as the market value of surrounding land. From the writer's experience (not, however, very recent), in well-developed farming country, he would say that these figures are very conservative, and that factors of from 2½ to 3½ would be more nearly correct; perhaps, 2½ would be a low average figure.

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It would not be fair, however, to use this factor of cost as a multiplier for determining values for taxation, for it includes the elements of temporary damages and incidental expenses which, obviously, should be excluded from an appraisal for taxation. If we assume that these amount to one-fifth of the total cost, the proper multiplier would be 2, and we would have the general rule that for taxation purposes, right-of-way land should be appraised at double the value of other land in its vicinity.

In the writer's opinion, it will seldom be found that a proper multiplier, determined in accordance with the principles here outlined, will fall below that figure.

It may be, and generally is, claimed by railroad men that the prices thus commonly exacted and paid for right-of-way land are excessive, and that such differences in value are factitious. The fact, however, that they have prevailed for half a century and over the whole country, whether the right of way has been secured by private purchase or by condemnation, would seem to indicate that the general ratio has a substantial foundation in fact.

The author refers to the fact that in the recent re-valuation of the railroads of New Jersey, where the purpose was avowedly to establish a basis for taxation, right-of-way land was appraised by the expert of the State Board of Appraisers at the same unit value as adjoining lands. The writer cannot but believe that if this appraisal shall be finally adopted as the basis for taxing that part of the railroad property, the State will fail to receive the amount of taxes to which it is justly entitled. The land (first-class) was appraised at nearly $47 000 000, but this embraced land for terminals, etc., the separate value of which is not given. Assuming that two-thirds of the whole was properly classifiable as right of way, which should rightly have been appraised at double the value of adjoining land, the State would lose, annually, taxes justly due it on somewhat more than $30 000 000 worth of property.

It is not asserted, of course, that the principles herein advocated will be applicable to every case for which an appraisal is called. Even in the absence of definite instructions calling for a different treatment, a great variety of conditions and circumstances may develop, which may require modified action in individual cases or classes of cases.

The writer's object has been to outline the general principles which, in his opinion, should underlie and control appraisals of this kind of railroad property.

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F. Lavis, M. Am. Soc. C. E.—Mr. Wilgus is to be congratulated on the very clear and concise presentation he has made of the basic principles governing the valuation of railroads. He has covered the ground so thoroughly as to leave little opportunity for discussion, and, although the speaker can do little but concur with him, it is, perhaps, not inap-

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In a discussion of the paper* on this subject by Henry Earle Riggs, M. Am. Soc. C. E., the speaker pointed out some reasons why valuations of the railroads might not be an unmixed evil, as seemed to be generally assumed at that time, the conclusion of that discussion being as follows:

> "First, that valuations properly made may be the means whereby confidence may be restored, not only in the mind of the general public, but in that of the investor; but, in order to obtain this result, the railroads should urge, with all the power they possess, the necessity of having such valuations made by a body of men, some of whom, at least, should be engineers, big enough to entitle their opinions to the respect of both sides, and thoroughly qualified by training and experience for the work.
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> "Second, that, as far as possible, regulation should be general or national, so as to avoid the complication of dividing all roads at the State lines, and of having different regulations in different States.
>
> "Third, that there need not necessarily be any relation between rate regulation and rate-making. Rate regulation can well be confined to rates in the aggregate, rate-making applies to the adjustment of individual rates, and must necessarily be the work of men well versed in all the varied elements which control it and the particular conditions affecting the business of each particular road."

The paper by Mr. Riggs was an able discussion of methods of obtaining the cost of reproduction, but the author refused to recognize that the consideration of the so-called "intangible values" had any place in a physical valuation, and he did not consider that the purpose for which an appraisal was to be made should have any influence in determining the value of the property.

It is the discussion of these particular points by Mr. Wilgus which the speaker believes should be emphasized. He points out distinctly that the reason for making the valuation, or the purpose for which it is to be used, has an important bearing on the method of making it, and also states the principles which should guide an experienced man in making a reasonable estimate of at least some of the so-called "intangible values," or perhaps it would be better to say that he has outlined so completely the really tangible values as to have eliminated all or nearly all which can be called intangible, which are included in the unbreakable circle of argument in which it is claimed that the rates are based on values and the values on the rates.

It is shown in the first place how the appraisal of the individual items composing a railroad, without relation to their value as correlated parts of a whole, may be justified for taxation purposes, but is not a proper method for determining the value of the property as a living entity, that the "original cost to date" method is untenable on account of the almost universal lack of records of any value and for other reasons, and the conclusion is that the "Cost of Reproduction New" is the only method whereby an appraisal can be made which will be fair and just to both railroads and public, and will give a fair value to the property as a whole and as a railroad, if it be properly made.

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* *Transactions*, Am. Soc. C. E., Vol. LXXII, p. 174.

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Leaving aside the question of taxation, which is really a local issue, the valuation of the railroads is now to be made by the Interstate Commerce Commission principally in order to determine whether the capitalization is fair, whether the rates now being earned give a fair return on that capitalization, or as information on which it may base its judgment in regard to new capital requirements. To one with experience in other countries, where the regulation of the railroads is most jealously guarded by the Government and where it does not act either as a serious deterrent to development or serious inconvenience, this does not appear altogether undesirable or unreasonable, but, whatever one may think about this, it is begging the question to say that no valuation will give adequate values for these purposes. What we have to do is to admit that valuations are to be made practically and solely on this account, and determine how they may be made properly.

The application of any valuation of a railroad property to the adjustment of rates is, of course, complicated, and it can easily be imagined that, on first consideration by any one at all familiar with the intricacies of rate-making, the difficulties appear insurmountable. Suppose fair valuations are arrived at; suppose a fair return on this value is fixed, and the aggregate of the rates raised or lowered by a certain percentage to give this assumed fair return; how, it is asked, are the differences in management and the thousand and one other inherent differences in physical characteristics and conditions to be overcome? There would be no competent answer to this were each railroad to be taken as a unit or an attempt made to regulate individual rates, but, inasmuch as it would be difficult to change a rate on, say, the Pennsylvania between New York and Chicago without making a similar change on the Baltimore and Ohio, Erie, New York Central, etc., it seems impossible to use such valuations as may be arrived at for any other purpose than the regulation of the rates as a whole over a distinct section. That such a method of rate regulation is a practical one has already been recognized by the Committee of Presidents of the Eastern Railroads. For some time that Committee has endeavored to obtain permission to raise certain individual rates which were admittedly too low, but the opposition from the shippers has prevented favorable action by the Interstate Commerce Commission.

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The Committee, therefore, has now decided to ask for a blanket increase of a certain percentage on all rates throughout the Eastern territory, as there seems to be far less objection to the rates, *per se,* than to any change in the relation of certain individual rates to certain others, and this is quite in line with the speaker's conclusion in his discussion of Mr. Riggs' paper.

The trend of practical endeavor, therefore, as well as a common-sense view, seems to lead to the conclusion that the only adjustment of rates can be a blanket one, covering a large section of the country where prevailing conditions are generally similar, and to the speaker this seems to put the question of valuation on a basis where many of the objections, which may be and are quite properly raised, against valuation of separate roads or parts of them, can be overcome.

Most of the arguments against any theory of basing rates on valuation are founded on the inherent differences in physical characteristics, methods of management, local conditions, etc. In an address delivered before the Southern Commercial Congress, in April, 1911, by Charles Hansel, M. Am. Soc. C. E., it was shown that a higher or lower rate of gradient on two or more competing lines might materially affect their value. He assumed three lines, each 100 miles in length, the first with 0.3% grades, the second with 1.0% grades, and the third with 1.136% grades, and showed that for a tonnage of 10 000 per annum the capitalized value of the additional cost of hauling the tonnage on the two latter might amount to some eight or ten millions of dollars.

Of course, the assumption of two roads between the same termini with essentially different physical characteristics is the *reductio ad absurdum* argument. As a matter of fact, when there are two or more roads between the same termini, or which reach the same points, the rate between these points for the same class of commodity is the same, no matter what the operating conditions of the properties are. If the valuation of the property is for the purpose of purchase or sale, the operating value, as affected by the physical conditions or physical characteristics, should be considered, but, if the valuation is used as a basis for fixing rates between competitive points, it cannot be.

Such a case as that cited above is, from a practical standpoint, purely theoretical, and it may be admitted at once that, if there were any two such roads, no valuation would be a fair basis for fixing the rates on them. If the rates were fair for one, they would be likely to be unfair for the other; looking at the matter broadly, however, there can be no more reason in the valuations to be made by the Interstate Commerce Commission for comparing physical conditions or physical characteristics of competing lines than there is now. No two lines could be more dissimilar than the Pennsylvania and the New York Central between New York and Chicago, and yet the rates are the same. If the Erie Railroad spends a large sum of money and makes improvements which will reduce its ruling grade to, say, 0.3%, it can hardly be expected that on that account it will be compelled to adopt a lower rate than it charged before, because it can operate more cheaply, or charge a higher one because it has spent a lot of money.

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There is, perhaps, a certain class of individual rates between local points which are, and probably will continue to be, subject to investigation by the Interstate Commerce Commission or the State Boards. The regulation of these rates, if necessary, must inevitably be based very largely on the cost of service, and, as a basis for determining this, or at least as a starting point, there would seem to be nothing better than an adequate appreciation of the value of the property involved. It seems improbable though that there could ever be considered even, the proposition to fix rates separately on, for example, the Pennsylvania, the Baltimore and Ohio, the Erie, and the New York Central on the basis of the valuation of the individual properties, or even a combination of the values of the physical properties with the capitalization and earnings of each individual property; but that need not prevent the use of a fair valuation taken together with an appreciation of the cost of operation, as a basis for a general advance of rates which might be shown to be necessary in order to provide a fair return to the stockholders and an inducement for the provision of necessary new capital.

It seems to the speaker to be entirely outside the realms of practical discussion to consider for a moment the actual costs of any of the parts which go to make up the railroad as a whole, except as such costs might be a sidelight on their value to-day, or we would never get anywhere. Take, for instance, right of way: some of it may have been given free; it may have been paid for at ten times its value; it may have been obtained by right of eminent domain and the legal expenses charged to something else. Rails were bought at $20 or $40 a ton which would now cost $30. A tunnel was built at a cost to the railroad by which the contractor lost money; another at a cost which allowed a good profit. The whole road may have been bought at a foreclosure sale and so on, almost without end.

The speaker was asked some little time ago to prepare a basis for the determination of unit prices to be used in connection with the valuation of a certain railroad. In looking up actual costs of rock excavation to this road, many contracts were examined dating from 1880 to the present time, the prices ranged from 65 cents to $2.50 per cu. yd., and all within a comparatively narrow range of territory. This, of course, is nothing new, but surely no one with any experience could expect to base the value of the rock excavation on, say, the

Mr. Lavis. Erie Railroad as it exists to-day, on such original costs of parts of it as might be found by an examination of the records. There are altogether too many complications to make it possible to consider original costs, except such as those in which all the governing factors are known which may be used as a guide in determining present-day values. A rock cut may have been taken out originally at $1 per cu. yd., and a slice taken off the side for another track might easily have cost $2, or even under certain conditions less than it did in the first place. It seems to the speaker that, looking at the matter from a practical standpoint, these and innumerable other complications of a similar nature cannot be considered now. We can only consider what it would cost to take that cut out if we had to do it to-day and get it in the shape it now is, and that is quite within the range of the ability of practical men. Really, the cost of reproduction new is the only logical, practical way that will give results which, at least, will be as fair to one road as to another, and as fair to the public as to the railroads.

In many countries where the Government has retained full control over transportation enterprises (and, after all, if at all fairly exercised, this is far better than either unbridled private enterprise or Government ownership), the amount of the capitalization which will be recognized by the Government is definitely fixed. The first cost is determined and approved during and on the completion of the construction, after a satisfactory investigation of the books, and additions made yearly to cover the additional capital expenditures. In the United States, for many good and sufficient reasons, and others equally bad and insufficient, we have let the railroads alone, and now the Government is trying to regain the control it should never have relinquished. As long as this control is fairly exercised, we shall be all right. To exercise it fairly, those charged with it must have knowledge, and one of the things they should know is the value of the property they are controlling.

This value can be obtained fairly, but, it seems to the speaker, only by putting everything on a common basis. There can be no fooling with such questions as "right of way has no value because it has been given to the railroad," or that it "has not increased in value," or that "if we wanted to reproduce it to-day we would not pay a farmer three or four times the acreage value if we cut through between his homestead and the rest of his land." Such speculations as these open up vast vistas of discussion to which there is no end. The "Cost of Reproduction New" is entirely practical and one well within the range of the understanding of any fairly intelligent person. To obtain it fairly needs practical experience, training, and a knowledge of railroad conditions, and Mr. Wilgus has done a service in calling attention to some of the matters which, if the work is to be done properly, must receive most careful consideration from those who he truly says are "burdened with a Herculean task" in undertaking to value all the railroads of the country.

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The necessity for the employment of competent men is pointed out, and this fact should be emphasized, for though it may be generally admitted that a certain number of competent engineers are required, it is not always conceded that railroad as well as engineering experience is required in many of the comparatively minor, or at least intermediate, positions.

Even the first step, the compilation of an accurate inventory of the property of a railroad, must be taken by men in the field who have become capable by long association with railroads in the making and in their subsequent maintenance. Take, for instance, the one item of the earthwork on a railroad, the questions of settlement of embankments built across marshes, the settlement of the embankments themselves, the estimation of slides, the classification of the material, haul, the general seasoning of the whole roadbed, etc., cannot be properly answered or values estimated by any but men of experience who can and do judge the conditions on the ground. The task of making an inventory and fixing prices of the measurable items, although one of great importance, is well within the range of an organization which can be developed from the large number of competent engineers available who have had fairly long and wide experience in railroad construction.

The really important matters pointed out by Mr. Wilgus, however, are the estimation of the value of the two stages of the development of a railroad preceding and succeeding the actual construction period, and the speaker believes, with him, that an equitable valuation of the costs to a railroad during these two periods is not an impossible or impractical task, and, if fairly made by men of widest experience in railroad affairs—not merely engineers with only construction experience—will largely cover the so-called "intangible values."

Until very recently the speaker thought that the position taken by Mr. Wilgus, and as expounded in this paper, was so obvious that there could be little chance for argument, but there still appears to be a large number of otherwise intelligent people who continue to think that the valuation of railroads is necessarily different from the valuation of any other business property, in other words, that the valuations to be made are to be simply an inventory of ties, rails, locomotives, etc., with a price for each, and that the "good will," etc., is to be ignored. We have, perhaps, rather ignored the discussion of the "intangible values," because we have not been able to see quite clearly how we were going to estimate their value, but that may be due to the same state of mind we are often in, when approaching any

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problem of importance which may come up. We may have a bridge, or tunnel, or anything else, to design and construct. When we start we may not know exactly how it is going to turn out, even though we know we can do it; we know there are difficulties; we know that the first tentative designs will be all changed; but we also know that if we keep at it long enough and with a sufficient degree of intelligence, backed by experience, we shall work it out. It seems to the speaker to be the same way about valuation. Proper consideration will show that many of the so-called intangible values have considerable substance, and a fair determination of their worth can be arrived at by a proper process of intelligent application. Mr. Wilgus has drawn a broad outline of the matters to be considered; it is for those who have the work to do to fill in the details.

There might be endless discussion, of course, in regard to what these values should be, but it looks as if we had come to the point where some one will have to decide. It is not a question of absolute right, but of coming to a decision which will be as fair as possible to all concerned. There is nothing impractical in this, the absolute right of the majority of disputes is seldom reached, most decisions are compromises or, at least, the best judgment of some man or body of men, and it is usually only necessary that we be assured of the competence and impartiality of the tribunal to permit us to acquiesce in the decision. It is necessary, however, that we be assured of the competence as well as the impartiality, and that all pertinent matters will receive due consideration. The necessity of this latter should perhaps be emphasized most particularly in connection with the estimation of the costs or value of those items which exist but are not easily or physically measurable.

Mr. Churchill's remarks seem to convey the inference that he prefers the method of "original costs", and that he believes this method to be practical.

As the writer understands the situation, the ruling of the Courts and of the Act creating the Interstate Commerce Commission makes it necessary, or at least desirable, that original costs shall be shown wherever possible, but only as a guide to the value of the estimate showing the "present fair value."

The *Railway Age Gazette** seems to express the prevailing opinion in regard to the present fair value quite clearly, as follows:

> "When property is taken under the power of eminent domain, the value on which the compensation paid for it must ordinarily be based is its value at the time it is taken. The amount which it has cost its owner may be considered in the endeavor to ascertain its present value; but it is the payment of its present value, and not of what it has cost its possessor, which constitutes just compensation. On the same principle the valuation of a public utility to establish a basis for the regulation of its rates must, it would seem, be based on the present value of its property. That this is the correct legal view certainly seems to be a just inference from language repeatedly used by the federal courts."

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If the original contracts, agreements, or book costs, can be found, showing exactly the cost to a railroad of a certain part of its property, it is, of course, very good evidence tending to prove the value. The difficulty of applying these values, however, and one which it hardly seems necessary to point out, is in identifying the structures covered by the original costs with those existing to-day. Is there a single cutting or embankment on any railroad anywhere in the same condition it was 5 years ago? to say nothing of those on which the original work was done 75 years ago. (There were nearly 7 000 miles of railroad in operation in 1850, mostly in what is now official classification territory.) Even if we had exact records of the original cost of each cut and fill and of all the work done on it since, which should properly be charged to capital account, would that give a "fair value" for the property in use at the present time, and on which the regulation of the rates and of the amount of new capital requirements are to be based?

The fact of which we, as engineers, are all very proud, and which is undoubtedly true, as Mr. Churchill says, that most, if not all, contracts for railroad construction are honestly and fairly made and executed, does not seem to the writer to be any necessary criterion that they represent a fair value of the property in use to-day.

There is also another objection to their use, that, from the standpoint of the public, which rightly or wrongly looks on the railroad as an opponent, these contracts will be looked on as *ex-parte* evidence. As evidence tending to prove the correctness of the inventory, for showing exact quantities, classification, character of materials, etc., every jot of evidence shown by the old contracts and plans should be sifted out and used for what it is worth, and this is one of the smaller tasks in making a correct inventory, which, in itself, might be called stupendous, except that we have to be somewhat chary of such adjectives nowadays when nothing seems too large to be undertaken.

It is entirely feasible and a matter of common practice to base a fair present-day value on the consensus of opinion of competent men engaged in practical work of the nature under consideration, and whose experience entitles their opinion to weight. Any other value, say that of 5 years ago, or 10 year hence, or even the actual price paid, is open to controversy as not being fair. If the value of 5 years ago is taken, why not take it for 10, 20, or 50 years ago? If a railroad is to be criticized, as it may be, for awarding contracts for

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* September 12th, 1913.

Mr. Lavis. supplies at exorbitant prices to friends of officials, even if its construction contracts are fair and just—and who shall say they always are—why is it not also entitled to credit when, for any reason, it gets supplies or construction done for less than the present-day market value, as it sometimes does? All these matters, however, invite controversy, but a fair valuation, made by competent men, based on the present "cost of reproduction new" is practical, can be defended, and, if properly made, will be accepted. It seems to the writer doubtful whether any other value can or will be.

The point brought out by Mr. Churchill, that the records of all variations shall be kept in the forms of accounts prepared by the Interstate Commerce Commission, would seem almost to bar the use of original records, except for their worth as evidence tending to show the present fair value.

Mr. Crehore. WILLIAM W. CREHORE, M. AM. SOC. C. E.—This admirable paper shows the author to be thoroughly familiar with his subject, which he treats in a comprehensive and exhaustive manner not to be expected from any other than a railroad official of wide experience. On some of the special points, however, which are matters of opinion only, a layman may be permitted, perhaps, to differ from the author's conclusions without exposing himself to the charge of presumptuousness. On this basis, the speaker wishes to take one exception to the opinions advanced in the paper.

In enunciating the basic principles of procedure and the several ways of determining the physical value, Mr. Wilgus refers to the method known as "Cost of Reproduction, Less Depreciation," and states that, for rate-making purposes, it seems to him that the physical depreciation should not be deducted from the cost of reproduction new. His reasons for this are "that all expenditures for renewals and repairs should be charged to working expenses, and not to capital," and that "normal depreciation is not to be treated as a wastage of capital, but as an element in the cost of operation that is covered by the rate." He then goes on to state that the law requiring "that valuations shall be revised from time to time as improvements and other changes are made, in effect prohibits the deduction of depreciation, as otherwise the constant addition of amounts expended in the replacement or renewal of items that had been included in the valuation at their depreciated price, would be a violation of the rule of the Interstate Commerce Commission that operating expenses should not be charged to capital."

The fact should not be lost sight of that betterments and improvements, when paid for out of income, are just as much property as if paid for out of capital, and, as assets of the company, they should be included in the inventories made from time to time. It is the evident

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It is customary to look at depreciation as a stockholder's liability, but, in truth, it is his liability only because he has received in dividends at some previous period the money which should have been expended to keep the property up to 100% efficiency, or which should have been put into a fund to be used for that purpose. It is unquestionably the moral duty of the management to keep the company's property up to its full efficiency, or to establish out of the income an equivalent reserve fund. When this is done, there can be no liability for depreciation on the part of the stockholder. Whenever this money is paid to him as dividends, however, instead of being put into the property, he is then actually receiving back part of his original investment, on the instalment plan, as it were. If, then, the stockholder has received this part of his investment back, it certainly remains no longer among the assets of the corporation; hence, to obtain a proper value of the assets, for rate-making purposes, or for any other purpose, the amount of this depreciation should be deducted. The opponents of this view certainly will not contend that rates should be made proportionate to assets which do not exist in the corporation.

The author's view that depreciation should not be deducted is based on the stockholder's liability to be called on at some future time for fresh capital to put the property back to 100% efficiency. Until that time comes, however, and the stockholder does thus put his money back into the property, is there any reason why the rates should be large enough to pay him dividends on that portion of his investment which he withdrew from the corporation, as well as on that which he still has in it? Or if, as is usually done, the property is put back to full efficiency by the use of future income (that is, through an issue of bonds), is there any good reason why the stockholder should be the sole beneficiary from that operation which has cost him nothing? Does it, in the first place, seem just to make the public pay rates high enough to cover dividends on the depreciation of the property, when the equivalent of that depreciation has already been paid back to the stockholder? In the second place, is it just and right that the rates should be high enough to cover dividends on the original value of the property in-

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cluding depreciation, and, at the same time, high enough to retire an issue of bonds necessitated only because of the withdrawal of the depreciation reserve fund by the stockholders?

To make the rates high enough to cover future betterments and improvements and to lay the money aside for this purpose is one thing; but to make such rates and then devote the money thus raised to dividends based on the original value of depreciated property cannot be justified. The stockholders should not expect to "have their cake and eat it too." To argue that this is customary does not justify it as good practice, nor does it appeal to the fair-minded gentlemen composing the Interstate Commerce Commission as being either good theory or good practice. Any corporation which is handled so as to allow its property to depreciate without providing a fund out of the income as the equivalent of this depreciation, cannot claim that the full investment of the stockholders is represented in the assets of the corporation, and, therefore, cannot expect to be allowed a rate based on fictitious property just because it has been capitalized.

The market value of any property other than a public utility, that is, any property unregulated by law, is a direct function of its income, fluctuating with the income. This market value apparently is unrelated either to the intrinsic value of the company's assets or to the amount of capital invested. Investors look only at the rate of income and the safety of the investment. If, for instance, the stock of a reliable concern pays 40%, this stock cannot be bought at par; but the market price will be well up to a point where dividends on it will be normal.

Now the difference between this market value of the "going" concern and the actual intrinsic value of its real assets is ascribed to the "good-will" of the business, or the "franchise" value, as it may be called in the case of a public utility, meaning thereby the value of its intangible assets. If the business is highly prosperous, the good-will or franchise value is correspondingly great. The actual intrinsic value of a going concern's real assets does not change merely because of the advent of prosperity or the reverse, but the good-will or franchise value does vary for this cause. With some very highly developed monopolies, the good-will value of the business is the largest asset, the intrinsic value of its property being merely incidental.

This being so, it is evident that the problem before the Interstate Commerce Commission, in regard to railroads, is to reverse the natural operation of an unrestricted monopoly. Instead of "charging all the traffic will bear" and determining the good-will value of the business by the amount of income, as is common with a private corporation, the Commission's problem is to ascertain the value of the assets (intangible as well as tangible), and then to make the income conform with it by virtue of the rate-making power. This difference between a public utility and a private corporation seems generally to be unrecognized. In the working out of this problem there is very little to be learned from the example of private monopolies, excepting as they may be said to teach "how not to do it". In the Commission's problem it is necessary to prevent all exaggeration in respect to the good-will or franchise value in determining the value of a railroad's assets.

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A railroad is a monopoly created by the law-making power primarily for public uses. A private corporation, on the other hand, is created primarily to make money for its stockholders. A railroad's charter is granted by a special agreement with the Legislature, and gives it an exclusive monopoly in its own territory, except at and near the terminals. Such a monopoly must of necessity be regulated by some common authority, in order that the communities through which it operates shall not be discriminated against in comparison with those similarly situated on other railroads, and for the further reason that the railroads are practically indispensable to all business interests. Each year sees the business of the country more and more dependent on the railroads for the interchange of commodities.

For these reasons, also, it is necessary that the public authority in control of the railroads should endeavor to have the rates fixed as low as is consistent with the value of the capitalist's investment. This investment, however, certainly does not comprise betterments and improvements which have been paid for exclusively out of rates (which, for this reason, are excessive rates) charged to the public. In this respect a railroad's opportunities to make money for its stockholders are far greater than those of a private corporation competing for a livelihood; and railroad investors have so long been accustomed to the advantage they possess for making the public pay for anything they want, that it will not be an easy matter to attract them when these opportunities are removed, although the return on their actual investment should still remain as good as, or better than, that of corporations in private business.

Neglect to provide depreciation funds is in the same category, both financially and economically, with the omission to establish sinking funds for outstanding bond issues. Both practices have brought about an enormous inflation of values by the introduction of fictitious capitalization. Bonds have been left outstanding long after the property or equipment purchased with their proceeds has become useless; or, if refunded, the effect is the same, because stockholders claim their share of the earnings beyond the lifetime of the property to produce which their proceeds were applied. Whenever an issue of bonds is refunded, which ought to have been paid off by a provision out of the earnings, its claim is added to that of the new bond issue for a

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share of the future earnings. Such bonds as are not co-terminous with the life of the property originally purchased with their proceeds, serve to increase the burden of inflation, because the security that was once behind them is abandoned, useless, or obsolete. To provide income for bonds like these is to carry a fictitious investment on the books, and with every refunding of debts that ought to be retired, the load of over-capitalization receives a new increment.

It has come to be the popular conception that to capitalize anything is to provide an income for it. But capital is wealth; therefore, when an income is provided for something which does not exist, there results a form of capitalization which adds no wealth to the property at all, but is fictitious capitalization or over-capitalization. It provides an income for fictitious investment. Property which has become obsolete or superseded by other property ceases to have any earning power, and is no longer entitled to any income. Hence the bonds, from the proceeds of which it was originally purchased, must be retired by the earnings of the period covered by the life of the property in order to prevent over-capitalization or inflation.

An exact compliance with this theory is, of course, not possible in practice. With the railroads of the United States, progress and development have caused such unforeseen changes in recent years that it has not always been possible to arrange bond issues which should terminate with the life of the property represented by them; but there could have been, and should now be, made a more vigorous effort to retire such issues as have outlived their usefulness, by payments out of the earnings rather than by refunding, and it must not be expected that the public will permit rates to be increased in order to enable the railroads to make a readjustment which has been necessitated by excessive rewards to stockholders. The stockholders have "eaten their cake" and that of the bondholders too, and their efforts to get the public to feed the bondholders no longer deceive the majority of those interested.

The great incentive behind this movement for the valuation of existing railroad property evidently lies in a desire to have more complete and definite knowledge as to the size of this load of over-capitalization carried by the railroads. The extent to which progress and development have contributed item after item to the load of over-capitalization in recent years is not realized by many; and the inflation itself is totally denied by others. Naturally, there will be some among the latter who will be strongly impelled to complicate the valuation work, and to seek out every possible pretext for making the assets, both tangible and intangible, look as big as possible. It should not be inferred from this statement that Mr. Wilgus is credited with any but perfectly sincere and honorable motives in his elucidation of the subject.

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Throughout the paper he has repeatedly stated that the method of obtaining the physical valuation should be chosen with reference to the purpose for which the valuation is made; that is, for purposes of rate-making he would recommend a method giving a different result from that obtained by the method he would recommend for the purpose of selling the property. Perhaps still another method might be recommended for purposes of taxation. Much has been said recently about the increasing burden of taxation on railroad properties, and there is no doubt a tendency on the part of local authorities all over the country to assess railroad property more nearly at its true value than has been customary in years gone by.

Without in any way begging the question of physical valuation, the speaker takes the ground that the easiest and simplest way out of a complex and difficult situation, and one that would wipe out an immense amount of inflation, would be to order each railroad to put its own value on its property of all kinds, and to have it understood that the same value would be used in assessment for taxation as well as for acquisition of the property or for any other purpose. In other words, if there was any inclination to place a low valuation on the property for purposes of taxation, this would be counteracted by the knowledge that the Government would use that set valuation for rate-making purposes and for acquisition if desirable. With the aggregate of all these self-imposed railroad values thus put before it, the Interstate Commerce Commission could then determine fair and equitable rates based on these valuations. At least, if the rates thus determined were not fair and equitable, the railroad companies could not complain of the valuations on which they were based.

Our whole system of direct taxation is cumbersome, discriminatory, and unjust, putting a premium on shiftlessness. The man who keeps his property in good repair, his buildings and fences in order and well painted, is assessed far above his neighbor whose acreage is the same, but whose buildings and fences are dilapidated and broken down. If the estimate of each was accepted as the value of his own property, and if such valuation was registered in the public records to be used for all purposes, including taxation, the authorities would be relieved of a vast amount of burdensome detail, and if any injustice were done, the victim of it would have only himself to blame.

It is a poor rule that does not work both ways. What a boon such a system would be to the railroads for purposes of acquiring rights of way for extensions! Condemnation proceedings could be avoided, untold agents' commissions could be left out of consideration, and, best of all, an exact estimate of the cost of any proposed right of way could be obtained in advance merely by consulting the registered values of the property which it was desired to condemn. If the law

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authorized the condemnation, then the owner of the property would be obliged also by law to sell at his own registered figure. If property owners were permitted to change their valuations as often as once a year on a date fixed by law, and, when they failed to alter them, if the last previous valuation should be held to be valid until a new one was submitted on the regular date fixed for the purpose, speculation would be beneficially regulated rather than checked, and to the extent of the variation in taxation the State would share in the speculation, which is as it should be.

Under a general system of this kind applicable to all corporations and individuals alike, the unearned increment on unproductive but well-located property would be automatically and largely diminished. In any event, the full import of this feature would be shared by the State, and any tendency to exaggerate it would be checked by the proportionate rise in taxes. The author very justly complains of the excessive prices usually paid by railroad companies for property to be acquired for extensions and betterments; but, under the system just described, railroads would have to pay for such property no more than anybody else. Thus a prevalent cause of over-capitalizing railroad property would be removed, and not only would there result a relief in the financial burden, but a lower basis for rate-making purposes.

It is because of the very eminent fairness of this method of valuation that it is not likely to be popular. Property owners like to collect damages from some one when under compulsion to sell what is their own at a fair price for the public benefit. In fact, when a railroad is the purchaser, they too often look on the transaction as more beneficial to the railroad than to the public. At least they know that the railroad company is more likely to bid high for their property than any other individual purchaser, because land is capital, and the railroads are paying very high premiums for capital in any form. The intense sentimentality over property rights so prevalent in the United States would be sadly shattered if a man's rights to his property were reduced to just what he himself made them, and was able to pay for. As it is now, a man's property rights (within certain limits) are anything he chooses to think they are, and he does not have to sustain his exorbitant rating of them by one single item of expense beyond that of his neighbor who is similarly situated, but whose ideas are more moderate. Property owners in this country to-day are a highly privileged class, but are placed on a most unjust and discriminatory footing with respect to each other on account of the present system of direct taxation which is without uniformity, unsupported by reason, easily responsive to corrupt influences, and, most of all, is unstable or unreliable for revenue-producing purposes. The burden falls most heavily on those who refuse to take dishonest advantage of the system's weak points.

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The important question in rate-making seems to be, not what is the intrinsic value of the property, but rather what is the capitalist's actual investment, and what portion of the earnings should be allowed to be capitalized and to become a basis for further dividends to be met out of the rates. It will be admitted that the rates must cover, in addition to all administrative and operating costs, (1) repairs and renewals necessary to keep the property up to its full efficiency, or the equivalent in the form of a fund for the protection of the stockholders. and (2) a reasonable return on the capital actually invested. To increase the rates beyond this in order to provide betterments and extensions is no different whatever from paying the stockholders larger dividends to enable them to reinvest immediately in the business, because, eventually, these betterments and extensions are capitalized and handed to the stockholders as a present. Of course, money for betterments and extension does come from previous dividends, either of these or of other stockholders, in this or in other business; but the question is, what dividend rate ought to be considered sufficient to enable the stockholders to reinvest the needful amount in betterments and extensions and have something left for themselves. With a private corporation the answer is, make as much money as you can; but with a public utility the object is to serve the public just as cheaply as possible, and, therefore, the problem begins with a determination of the minimum return which can be offered to attract capital.

It has been said by railroad financiers testifying under oath that without the practice of capitalizing earnings and offering stock bonuses with bond issues, capital could not be attracted in sufficient quantities to take care of the necessary improvements in railroad operation. These statements are doubtless true, and indicate the extreme competition for capital at present prevailing in the United States. It would seem that capital ought to know its own interests well enough not to demand such large rewards that the business itself must eventually be throttled in order to satisfy its cupidity. This situation results from an interference with the natural law of supply and demand. As the wealth of the country gradually becomes concentrated in the hands of fewer individuals, the amount of capital outside of their control becomes less. All capital is wealth of some sort. As these people absorb an increasing proportion of the total wealth, they acquire control of a correspondingly increasing proportion of the total capital, and automatically with the growth of their monopoly the available sources of capital diminish. Under such competition for capital as results from this monopolistic control, it cannot be expected that railroad rates will be kept low if all the demands heretofore mentioned have to be supplied from the earnings.

The President of the Pennsylvania Railroad Company issued a statement on May 12th, 1913, in which he said:

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"In England the policy of railroad companies has been to pay out currently to stockholders nearly all of the net earnings, and provide for all improvements out of the proceeds of sales of capital stock. If the investors in the stock and bonds of the Pennsylvania Railroad had supplied directly all the money which has been invested in the transportation property of this Company, and if they received the entire annual net earnings from the operations of such property, they would today be getting only 4.83 per cent. upon their actual cash outlay."

Two conclusions may be drawn from this statement: one is, that if capital can be obtained on such a basis in England, it can be so obtained in this country from England by removing from our properties that most objectionable feature, over-capitalization or inflation; the other is, that if the capital for the betterments above referred to did not come from the Pennsylvania Railroad stockholders it must necessarily have been collected out of the public, or (if through bond issues) is now being collected out of the public. In other words, the difference between our method of financing railroad extensions and England's method is, that over there the capitalist puts up all the capital and receives a fair return for it, and here the public puts up most of the capital and makes a present of it to the capitalist, not only getting nothing in return for it except the improved service, but also paying rates large enough to cover dividends on the gift as well as on the capitalist's actual investment. If prevailing methods are persisted in, the logic of the situation will force an answer to this question: in financing a railroad, if the rate-payers are to furnish the lion's share of the capital anyway, what is the use of having any stockholders at all? They are merely an incumbrance.

About such a state of affairs comment is superfluous; a complete change in the system is called for. The reform has been well inaugurated by the authoritative movement to obtain a careful and complete physical valuation of railroad properties, and this movement should have the earnest and candid support of all who are interested to see better times for the railroads as well as for the communities they serve. With the knowledge thus gained, the next step will be to eliminate the load of over-capitalization now carried and to begin retiring bond issues out of the earnings, instead of refunding them and allowing their share of the earnings to pass to the stockholders. The class which has so long been getting something for nothing must be taught by the removal of such opportunities to be satisfied with a fair return on its investment.

To correct a misunderstanding which seems to have arisen in regard to the speaker's proposed system of fixing property values for taxation and other purposes, it should be said that by this system there would be no prohibition against any individual placing his valuation figure as high as he pleased. It has been suggested in this discussion that it would be a great injustice to a farmer to take a strip of his land for railroad purposes at the same rate of compensation as he would ask for the whole property. Of course it would. A strip dividing his property for any purpose, whether for a railroad or not, would damage what remained to him to a certain extent, but there would be nothing to prevent him from putting a valuation high enough to satisfy himself on that portion of his property through which it was at all likely that a railroad would pass, neither is there any reason why he should not place a higher value on some parts of his contiguous possessions than on others, and have it so registered. The only requirement imposed on the farmer by the system would be that he should pay taxes according to his own valuation.

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This would not be the hardship that some seem to think. There would be no general increase of taxes by an adoption of this method; the total amount collected for public uses will not vary because of a readjustment of values every year. The total amount of levy on a community remaining the same, the readjustment of values would mean merely a redistribution of the tax levy to correspond with the readjustment, which is as it should be. If a man thinks that his property is worth more than his neighbor's, he should be willing and ready to sustain his rating by paying proportionately greater taxes. The speaker cannot conceive anything unfair in such a method of taxation. The injustice to a community comes from announcing and maintaining values which are fictitious and misleading, or at variance with each other—low taxable values on the one hand and high selling values on the other. The merchant who asks one price from one customer and another price from another has a poor standing in any community. A sells property to B at a certain figure which both agree to keep secret. The newspapers, in the interests of speculators in the neighborhood, announce the sale at a figure very much higher than—perhaps twice as high as—the actual payment made by B, thereby misleading all property owners in the vicinity as to the real value of their own investments, and scaring off prospective purchasers or lessors who might have been attracted by a knowledge of the correct values prevailing in that community.

Discrimination in some form or other is at the bottom of all our industrial and financial troubles in these days. The injustice of our present system of taxation lies in recognizing one value for taxation purposes and a different value for purchases, and in discriminating between property holders who are similarly situated. Such a system promotes underhand work, and the tendency is to throw the burden of taxation on those who are not so well equipped as others to battle for their rights. If those who adhere in blind devotion to the present system would take into consideration the confusion it makes, the

Mr. Crehore. wrongs it perpetrates, the corruption it invites, and the false swearing it occasions, there would be a different feeling in regard to making a change.

As to what proportion of the betterments and extensions to railroad property should be provided from the proceeds of the sales of capital stock, and what part should be paid for out of the earnings—in other words, as to what extent surpluses should be capitalized—it should be understood that the speaker's whole contention applies to public service corporations regulated by Governmental authority, and not to Government-owned enterprises. Of course, where there are no stockholders, as in the latter case, it is proper that the rate-payers should furnish all the capital needed, as they are the sole beneficiaries of the increased earning capacity due to the betterments. The rate-payers, then, being the owners, whatever is done with the property redounds entirely to their injury or benefit as the case may be.

In the beginning it was assumed by the writer (and this assumption has been confirmed by the author) that the subject of the paper was based on the question: What is the proper way to ascertain the true physical value of railroad property; and only incidentally included the question: Shall this intrinsic value be used for the purpose of rate-making or not?

The writer's stand on the first of these questions was and is that a proper physical value of the assets can only be obtained by finding the cost to reproduce at prevailing prices and deducting a proper amount for depreciation, and that this resulting valuation should be used for all purposes where the correct physical valuation is called for. When, however, the correct physical valuation has been found, there still remains the question whether rates should be based on that or on something else. These appear to be two separate and distinct questions, although several of the parties to this discussion have treated them as if they were interdependent.

The utter hopelessness of getting a fair physical valuation by the Original Cost Method and the stupendous amount of work involved in getting it by the Cost to Reproduce less Depreciation Method was so impressive as to cause the writer to suggest the alternative of letting the railroads put their own valuation on property of all kinds. And yet—whereas an accurate value of the property could not possibly be ascertained by the Original Cost Method—there would be no difficulty in showing from the books just what money each investor had paid into the treasury; and, in the case of a public utility property, it is contended that this, taken together with a reasonable portion (not all) of the value of betterments and extensions, should be the basis of the investor's return paid to him out of the rates, the public being the beneficiary as to all the remainder.

Mr. Humphreys. Alexander C. Humphreys, M. Am. Soc. C. E. (by letter).—The writer is in complete agreement with Mr. Wilgus' statement that the task of valuing the railroads of the United States is Herculean. He has seen nothing to lead him to think that our politicians have any adequate conception of the magnitude and the almost, if not quite, insurmountable obstacles in the way of a competent solution of all the questions involved.

There have been some expressions from the Commission charged with the chief responsibility, to indicate that even its members do not fully appreciate the grave responsibility which rests on them.

In addition to the inherent difficulties, one has to face what the writer believes is a too common fault in the United States to-day, fear—on the part of those directly interested—of criticism and denunciation from an uninformed and prejudiced public.

Already men have been appointed to positions of influence in connection with this work who have demonstrated that they are incompetent, and, what is worse, are willing and able to labor for the destruction of legitimate property rights.

This and much more that might be said indicates that we have not to-day in the United States a proper background for these appraisals. There is need of an effective scheme of public education, not by indirection, but frank, fearless, and in the open.

Our Courts, public officials, and professors and students of economics should be included in the classes of those to be educated. The conflicting and often faulty opinions delivered by our Commissions and our State and Federal Courts demonstrate that we of the laity must not submit too subserviently to the opinions and decisions which are quoted for our control. We may have to submit temporarily in cases at issue, but we should never surrender our beliefs where we know that we, as engineers, are more completely and accurately informed than the theorists who attempt to control us. We must patiently, persistently, courageously, and openly combat the theories which we believe to be founded in error or on an incomplete survey of all the questions involved.

In order to meet those who are thus engaged in controlling the situation, however, we must be more at one among ourselves. The fact is that on some of the questions at issue engineers are not in complete agreement.

Thus the Commissions and Courts are given the opportunity to choose between opinions at variance, and so are encouraged to pick and choose, item by item, until there is consolidated all possible features which are unfavorable to a fair solution of this valuation problem.

Another obstacle to a fair and consistent system of valuation is pointed out by Mr. Wilgus: the widely varying laws of the several

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States, not to speak of the widely varying interpretation of these, often ambiguous, laws.

Unquestionably, Mr. Wilgus is correct when he states that, as a general proposition, valuations cannot be determined accurately and fairly through reference to the records and books of account extending back through the years. It is not difficult to explain, to those qualified to understand, why this is the fact—but the fact has to be met, apart from the question of an adequate reason therefor.

Nothing could be further from the truth that, because a railroad or any property of magnitude can be inventoried, even if accurately and completely inventoried, the valuation can be determined by the inclusion of the items thus inventoried. Omissions and contingencies are not thus covered. Surely no engineer who has had any broad experience in construction could honestly so claim.

It is often the contingencies, lost to sight in the completed work, which add materially to the cost, and this outside of such overhead charges as preliminary or initiation expense, interest during construction, administrative expense, cost of procuring capital, etc., etc. For instance, if an appraisal should be made ten years from now of the New York Central Terminal, would an inventory of the existing structures disclose the legitimate and necessary cost of this great undertaking? This point is well developed in this paper.

One of the most difficult features involved in public service appraisals is that of depreciation. This subject is misunderstood by many who claim the right to speak authoritatively thereon.

If the accounts are accurately kept, so that proper discrimination is maintained between charges to construction and to maintenance, no deduction should be made for depreciation from cost to reproduce new.

Troubles in this matter have, no doubt, in part been occasioned by the more conservative practice of late in keeping accounts so as to spread the cost of final renewals ("depreciation") more uniformly over the period benefited. This leads those on the outside—and sometimes those on the inside—to think that we should deduct the assumed or estimated accrued depreciation from cost of plant. A depreciation reserve is required only to point out to us year by year that there may be certain charges against income not shown by the current expenditures and so warning us not to over-estimate our profits; but, if final renewals have not been cared for completely in the current expenditures, then there is the liability therefor, resting against the proprietors, which must be met when parts of the plant come to be renewed. All repairs and all renewals, whether current or deferred, are chargeable against income, and so must be met by the rates. In the case of a public utility, adequately maintained and rendering efficient service to the public, to deduct for accrued depreciation according to the practice of some of our theorists, necessarily results in confiscation of investment.

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Certain appraisers of reputation have taken the ground that if, for instance, railroad ties have an effective life of 10 years, and one-tenth of the total number is renewed each year, there is no need for a depreciation reserve, but the value of these ties as a whole should be depreciated 50 per cent. Nothing, according to the writer's way of thinking, could be more fallacious. The property, as far as this item is concerned, is thus maintained at maximum efficiency. What more could be done? Why then should one-half of this portion of the investment be confiscated? If so ordered, then we should be permitted to include a like amount as one of the overhead charges. If such an elimination is a necessary feature of railroad operation, then this is a legitimate item of cost.

Those who have not studied this subject carefully seem to think that because we should expect to allow, if we were selling, and should expect to claim, if we were buying, an allowance to be deducted from the purchase price to cover estimated accrued depreciation, therefore depreciation should be deducted in an appraisal for rate-making. On the contrary, the reason for such an allowance for depreciation in case of purchase and sale, furnishes the reason for not deducting it from an appraisal of cost new; for this indicates that there is the assumption on the part of the purchaser of a liability resting on the present owner. This is well set out in Mr. Wilgus' concluding paragraph.

This feature of depreciation the writer has treated at length in a recent paper.*

In conclusion, the writer desires to state that we, the Engineers of the United States, must appreciate that on us rests the grave responsibility of protecting the innocent investor, the widow and orphan, from spoliation at the hands of honest and dishonest interpreters of the laws of our country—Federal and State.

Mr. Gandolfo.

J. H. Gandolfo, Assoc. M. Am. Soc. C. E. (by letter).—The problem of obtaining the physical valuation of the railroads of the United States is probably one of the most important relating to public service corporations and properties that has ever been undertaken; and the question of rate-making, whether founded on the results obtained from physical valuation or not, is dependent on so many questions, both economic and financial, as to make it very difficult to discuss the matter within the limits of a single article.

To investigate this matter of valuation and rate-making properly, it is necessary to study the historical development of the railroads from

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* "Depreciation: Estimated and Actual," read before the Institution of Gas Engineers of Great Britain.

Mr. Gandolfo. their beginning, and then to analyze the entire question according to the principles of economics. This necessitates looking at the problem in a way very different from the generally accepted financial viewpoint.

Mr. Wilgus attempts to show that, from every point of view, the only just and equitable valuation to be placed on railroads for rate-making purposes, is that of replacement value new; but are his premises correct in this argument, and is replacement value new the logical figure to be used for this purpose? Would such a basis of calculation be just and equitable to the railroads, as well as to those who must pay the rates?

When a physical valuation is undertaken, no matter for what purpose, there is no doubt that the replacement value new should be estimated, taking the average cost of materials and labor for the five previous years, as is usually done; but the actual cost to date should also be determined, by reference to records which may be available, or, if not, by reconstructing all conditions as they existed at the time of the building of the road. The depreciation of the various elements entering into such a property should also be estimated at the same time. These three items can thus be determined simultaneously at very little more cost than that necessary to obtain any one of them alone, and at infinitely less cost than would be necessary to obtain each one separately. In fact, it may be said that for all practical purposes it is necessary to obtain all three of these items as a basis for study and comparison.

Referring to the sale value of the various elements entering into the construction of a railroad, such valuation is productive of no results except, perhaps, as a very poor, makeshift basis for taxation. If quantities of materials such as go to make up a railroad, were suddenly thrown on the market, it would in most cases at once depress the second-hand price of each, and thus create a price far below even the ordinary sale value. On the other hand, even taking the market sale value for estimating purposes would, as Mr. Wilgus points out, by no means give any idea whatever as to the actual values or actual costs of railroad property. As for the sale value of a railroad as a whole, such a quantity may be said not to exist, as there are no buyers for such properties in the open market. When such a property has been offered for sale, it has been bought in by a syndicate composed more or less of interested parties, and at its own price.

On page 205, the author states that it would be a very difficult matter to get any idea of the original cost of the railroads on account of the non-existence of records on the subject, and gives this lack of records as an argument as to why original cost to date should not be obtained and used. The mere difficulty of arriving at a result is surely no excuse for not doing the work. It is only a matter of more time and patience, to go back and, with figures based on known prices for labor and materials of the period, reconstruct a road built fifty or more years ago, than it is to reconstruct the road under present-day conditions.

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Also, at various places, the author mentions different items of expense in the planning and construction of a railroad, which he seems to fear might be omitted in a physical valuation. On page 206 he says: "Reconnaissances, preliminary surveys, and estimates of cost, revenue, and profits are needed * * *", and, on page 211, various construction items are referred to as matters which should not be overlooked. It is difficult to conceive that any one engaged in a valuation or appraisal of a railroad, except the merest tyro at the business, would fail to take cognizance of such items. The cost of all preliminary work, of whatever nature (including promoting), and the cost of all construction work, should be estimated, no matter for what purpose the valuation is being made. One might as well try to estimate the cost of concrete in place, and say the cost of the form work should not be taken into account.

When it comes to including in the physical valuation the cost of what Mr. Wilgus calls "the educational and development stage", however, the writer fails to see why such expenses should be estimated for this purpose. This matter is purely one of operation, and the obligations which it was necessary to issue in order to obtain working capital in the early stages of a railroad, should have been paid off from profits, and a fund kept for this purpose from accrued profits. On page 207 the author says, "under the most favorable auspices, it usually lasts for several years". If a railroad is properly run and properly managed, the educational and development stage never ceases. For instance, the training and education of employees for their various duties never end. The study of places where economies can be practiced is something which should be in the mind of every one connected with a railroad at all times. The attempt of the advertising department to induce more and more travel, both freight and passenger, to patronize a given road, is also a never-ending work. As far as "errors of design and construction, as developed by operation," are concerned, these should be paid for out of profits, if there is money to pay for the work, because there is practically no limit to which such changes can be carried. To-day, expensive tunnels, long cut-offs, great trestles, deep fills, and heavy bridges, are being constructed on various railroads, simply to correct just such errors of design and construction; and if such corrections and betterments are to be capitalized as new development, what security is left for the obligations already issued against the original and now abandoned work? Of

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course, it must also be taken into consideration that improvements are often made for the purpose of handling increasing traffic and steadily increasing weights and loads of rolling stock. In all such cases, the only thing to do is to take the difference in cost between the old work and the new (if the cost of this new work is greater), and charge it to physical valuation. To illustrate this by a concrete case, assume a bridge, the original cost of which, complete, was $100 000. Now, assume that this bridge is replaced by one costing $200 000, either to correct some error in original design, or to provide for more or heavier traffic. Such a structure must be included in the valuation at its cost of $200 000, or $100 000 added to the original valuation of the road; but by no means should the total amount of both structures, or $300 000, be included in any valuation, or obligations issued against this latter amount, as has so often been done in the past. Thus, it can easily be seen that the engineer who attempted to include any such feature as this, of the educational and development stage, in a physical valuation, either for original cost to date, or replacement value new, would be confronted by a peculiar problem. He would not know where to begin, or where to leave off. It would be simply a matter of personal opinion as to what and how much to include to cover some arbitrary period.

Furthermore, in this connection, it is to be remembered that, like everything else, railroading has been a slow growth, and that it has not been necessary to organize forces from absolutely ignorant material to handle the complicated equipment and traffic of to-day. The transition from the small systems beginning in England in 1825, with a few miles of track, equipped with tiny cars and 8-ton locomotives, to the great transcontinental lines of to-day, with thousands of miles of track, cars with a capacity of 110 000 lb., and great Mallet compound locomotives, was not made in a single stride. It was a slow development, and the operating force was gradually trained and organized to meet the conditions as they arose. And, further, if it could be imagined that a great railroad system was to be created new, to-day, with miles of track, modern equipment, and great terminals, even then, it would not be necessary to organize a new force from raw material. All the men holding positions of any moment would be obtained from other railroads. A few years ago, the writer was connected with a new railroad while the operating force was being organized, and all the men in positions of any importance, including such as general superintendent, shop superintendent, heads of all operating divisions, etc., and, also, in many cases, the subordinates, were obtained from other roads.

In regard to cost of reproduction less depreciation, it does not seem as if any allowance should be made for depreciation, either in an original cost-to-date valuation, or cost of reproduction new, assuming, of course, that the road has been kept in first-class condition; that an amortization fund has been provided for, to meet all maturing obligations; and that some provision has also been made for obsolescence. If such items have not been fully provided for, then the question of depreciation may become a very important one, and must be given very careful consideration, with special attention to the object for which the valuation is being made. This can be made clear by referring to the coal pocket mentioned by the author on page 208. If a physical valuation had been made of this property the year before it was to be renewed, and if this item had been included at its full value of $600 000, there must have been one of two provisions made, as follows: Either an amortization fund must have been created, by which all stock, bonds, or other obligations, representing the full value of the coal pocket, will be retired at the end of the next year, so that new obligations can be issued to pay for the new work; or, if the obligations against the full value of the coal pocket are not to be paid off, there must be some fund, which, at the end of the next year, will amount to $600 000 in cash, so that the new coal pocket can be paid for without issuing any further obligations. Otherwise, if no such provisions have been made, the coal pocket must be included in the valuation simply at its present value.

Mr. Gandolfo.

This case illustrates another method which may be used to estimate depreciation, and that is, when the physical valuation is being made, to estimate the amount, in a lump sum, which it would take to put each item in first-class condition for the uses for which it was intended, and then to deduct this amount from the actual cost or replacement cost, whichever plan is being followed. This method of estimating depreciation has its advantages in that it eliminates assumptions and estimates, as to the probable life of a structure; but, on the other hand, it has its disadvantages, inasmuch as it only applies strictly to present-day values, and takes no account of the fact that depreciation is apt to be more rapid in the later years of the life of any structure. This is one of the reasons why the writer stated in his opening paragraphs, that values for depreciation should be determined for purposes of comparison and study.

On page 209, in discussing land values in regard to "original cost" valuation, Mr. Wilgus says, "it ignores the increment that is enjoyed by all other property owners through increase in the population and prosperity of the country"; but, in this connection, Mr. Wilgus seems to ignore the following fact. A railroad, or, in fact, any other public service corporation, does not occupy the same position, relatively to the public, or to the State, as a private citizen. A corporation has no being and no existence until created by the grant-

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ing of its charter by the State, which charter defines in just what direction the corporation is to exercise its functions. A railroad corporation is thus granted rights, privileges, and immunities by the State, which are not accorded to the individual. It is a fundamental axiom of both law and economics that something cannot be obtained for nothing, and thus, in return for these grants, the railroad must give up some things to the State, which the latter cannot demand from the individual. In regard to this question of land, it must be remembered that, especially in the early days of railroading in the United States, large grants of land were made to these corporations by the State, either without any compensation whatever, or at a merely nominal figure. It is not equitable that the present generation, having lost this land through no fault of their own, should now in addition be indirectly taxed for what their ancestors gave away without compensation.

In the following paragraphs the writer wishes to point out some additional anomalies and contradictions which would occur if the replacement value new was used as a basis for rate-making purposes.

According to an old print, the great Tring cutting, made in 1837, on the London and North Western Railway, was excavated by hand, and the spoil was removed in hand-barrows, guided by men, and pulled up inclines on the sides of the cutting by ropes passing over pulleys and worked by horse-power. In estimating such a piece of work for replacement value new, should these conditions be duplicated, only with present-day prices for labor and material, or should modern steam-shovel conditions prevail? It seems to the writer that, in a case like this, the railroad might find that, in spite of high labor and material prices, the cost of such a work would be much less than the original figure, and thus be an injustice to the company.

Referring to the temporary trestle work mentioned by Mr. Wilgus on page 211, on many of the early roads in the United States such structures were built of timber obtained along the line. It surely would not be just to estimate a value for such a structure based on present-day figures for the labor and materials entering into it.

About seven years ago, the cost of a certain class of steelwork, erected in place, was 4.07 cents per lb. Since that time this price has not been reached, but the same class of work has been done as low as 2.87 cents per lb., or a difference of 29½ per cent. It would not be just to say to the railroad which had paid the higher price, "Here, you must reduce your capital, because the work can now be done cheaper". This money was honestly invested, and it would be unjust to wipe out a part of such invested capital.

Another objection against replacement value new for rate-making purposes, is that it would be a constantly varying quantity, whereas

original cost to date would only have to be corrected for such additions and betterments as were added from time to time. Mr. Gandolfo.

In conclusion, it seems to the writer that for rate-making purposes, the total cost of the work to date, is the figure to be obtained. This figure represents the actual amount of capital invested in the enterprise. It may be argued that some railroads have depreciated, instead of appreciated, in value, and that no rate could be fixed, which would give a fair return on the investment. This is true, but in such a case the enterprise is not a success, the company is insolvent, and should be treated as such.

It may also be argued, as Mr. Wilgus indicates, that this method of valuation puts the older roads in a much more favorable position than those built at a later date. This is also true, but it was a question for the promoters and builders of these later roads to consider in their preliminary estimates, not for the State and the people to consider now.

Mr. Thomson.

T. Kennard Thomson, M. Am. Soc. C. E.—The Society, and indeed the whole country, owes Mr. Wilgus a vote of thanks for his very complete and valuable paper. It would be difficult to find a phase of the subject on which he has not touched.

The valuation of railroads is, of course, one of the most far-reaching and important investigations ever undertaken by this or any other Government, and the results obtained by the present Commission will naturally be of inestimable value. It is safe to say, however, that, unless this work is done in harmony with, and with the hearty co-operation of, each railroad, the results will not be worth one-quarter of what they should be.

Although the speaker is a strong believer in the benefits which will accrue from the present Government investigation, he thinks that the ultimate object is the "intrinsic value" of the railroads; that is, the real commercial value—not an artificial assumption.

If desirous of buying anything, one must pay what the seller can be persuaded to take, and he, naturally, will not sell if he thinks he can get a better price elsewhere. A seller likes to think that he is getting back all that was spent on his property plus interest, either simple or compound, but he would probably sell at once for a small fraction of the cost, if satisfied that the proceeds could be invested so as to net him a larger or safer income.

The value of a railroad, like that of any other property, must fluctuate enormously from time to time, due to changed conditions or changed management; and these fluctuations may have very little relation to the original cost of the property.

In buying a fine diamond, does the purchaser inquire what was spent in mining it? If two young men take the same course at

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Harvard, one at a cost of a few hundred dollars a year—which he earns as he goes—and the other at a cost of many thousands of dollars, will not the first almost invariably be able to sell his services for a higher rate? If these two boys were to invest the same amount of money in houses, one might build or buy a number of houses which he could sell for a big profit; the other might put all his money in a single house and not be able to sell it for one-quarter of its original cost. Two men might start a grocery business, under exactly the same conditions, but with entirely different results, as all know, and so on, *ad infinitum.* Why, then, should a railroad alone be forced to put false or fictitious values on its property—for sale, rate-making, or taxation, etc.—instead of its real value at that time?

Suppose a railroad is only a couple of hundred miles long. It may be in first-class condition in every respect, but if it has not a working arrangement with other roads at each end, whereby it can obtain its share of freight, its earning capacity will not be enough to pay operating expenses; and to-morrow a new manager may "get the business" and pay the stockholders a handsome profit. This has been done over and over again. In one case a young engineer, who saw a western road which was "run down", told the owners what he could do if they paid him a percentage of the profits; his proposition was accepted, and this made him a multi-millionaire. How would any basis of actual cost, or cost of reproduction, be applied to these cases?

Mr. Wilgus very truthfully states that it is impossible to ascertain the real cost of a railroad already built. He also states that it has never been possible to predict the actual cost of a road; "cost of reproduction" would come in the same class.

Among other things which have cost the railroads much and would be hard to find are the items of ballasting mentioned by Mr. Wilgus, who states that 24 in. of ballast are needed. In many cases the depth of the ballast is actually more than 12 ft.

Cost of litigation, and other obstructions by property owners, are enormously expensive, not only directly, but also in the brain energy required to overcome them, which might have been spent on the construction or operation of the road. For instance, the Chesapeake and Ohio Railroad, being unable to obtain from an old Virginian permission to use part of his property, took possession. The owner removed the tracks and buried the corpse of a woman there; the railroad company dug up the body and buried it 150 miles away; the owner found the body, brought it back, and again buried it on the "right of way", this time embedding it in concrete. As the concrete was very hard, and the railroad company did not like to use dynamite, it simply raised the grade of the track, and allowed the body to remain in peace under the rails.

Mr. Thomson.

Without the co-operation of the railroads, an investigator might easily overlook the old New York Central Railroad line through Kingsbridge, New York City, and estimate the Marble Hill cut-off at a fraction of its cost. In the West a railroad tunnel which had been closed three times by land slides was abandoned for a temporary line with a very sharp curve, and years afterward was rebuilt in a different location.

But why continue when every one knows that the exact cost of an old or to-be-built railroad can only be ascertained approximately?

Mr. Crehore's suggestion, that the railroads put a valuation on their own property, has much merit, and reminds one of the method used in Germany for many years, the speaker believes, successfully, whereby the owner of a house gives the valuation of his property, and this is used by the Government for purposes of taxation and fire insurance.

Mr. Churchill.

Charles S. Churchill, M. Am. Soc. C. E.—In the speaker's opinion, Mr. Wilgus should be thanked for having brought out his points in a very clear form, these points being recognized as generally correct. Within a few weeks after the issuance of the paper the Government officials made some very important statements: First, that the valuation of properties of common carriers in compliance with the Act, Section 19-a, is an original proposition; second, that it is a continuing one; and, third, that the physical elements must be compiled or estimated in accordance with the Interstate Commerce Rules of Accounts, as stated in the Act.

Under the first statement, that the valuation of properties is an original proposition, it appears probable that no value which has heretofore been made will fully meet the requirements of the Act. Under the second statement, that the requirement is a continuing one, it becomes extremely important that accurate records shall be kept of the cost of all work, in accordance with the Interstate Commerce accounts. This statement also has led to plans being formulated by Government officials for preparing their files to cover 100 years. The third statement, that all records and estimates shall accord with the Interstate Commerce accounts, is one of the most important features of the whole Act, because this simple requirement answers many of the points raised in the written discussions on this subject, especially for the reason that the Interstate Commerce accounts are quite clear. Therefore, it is thought very important that the law should be studied very carefully, as it is a good one in many respects.

Many progressive railroad properties double themselves within 20 years; therefore, suppose one makes a valuation now, 20 years hence very little trace of the items reviewed at this date will be found, because the properties are changing and building up constantly.

Mr. Churchill. The question has been asked, "What has the public gained in existing railroad properties"? Recently, some records of railroad construction between 1850 and 1856 have been found, which show that a railroad was being built across one of the Colonial States, and that within 6 years—before it was entirely completed—the actual returns in taxable values were doubled in each of the counties through which the railroad passed. This old record shows where both the individual land owner, and also the communities, counties, and State have gained from the fact that certain individuals combined in constructing railroad properties. This is one kind of return out of many others which have come to every community and State in which railroads exist.

Attention is called to the point in the law, that the valuation asked for is not confined altogether to physical features; also, that the law specifically calls for the cost of the property to date; in other words, that the investment in a property must be determined as closely as practicable, as being an important element. If, therefore, a railroad has built a property within recent years, or has bought one at an earlier date, and has made considerable additions thereto since the date of acquirement, the original cost plus the additions must be determined. In most instances records of expenditures have been carefully kept, and usually there are three parties to these records, namely, the railway company, the contractor, and the engineer. The amounts paid, therefore, show on their face the true cost of the work when built.

Finally, attention is called to the recent decision of the Supreme Court in the Minnesota Rate Case, wherein a favorable decision was given in one case, and, in that case, the original investment was protected.

In conclusion, it seems important to draw attention to the greater likelihood of overlooking items of cost after the structure or railroad has been completed than in making proper allowance for contingencies before the work is undertaken; and that these items of cost, which are so likely to be overlooked in works already completed, should be searched for in great detail, so that the application of percentages to cover past contingencies may be avoided as far as possible.

Mr. Coombs. R. D. Coombs, M. Am. Soc. C. E. (by letter).—It would appear to be necessary to have a more general acceptance of what is meant by "cost" and "value": Whether the "cost" of construction is its actual cost, what it should have cost under actual conditions and average good management, or what it should have cost under average conditions and average good management; and whether the value new corresponds with any or none of these.

Assuming that the railroad's actual expenditures could be determined, they would in fact represent the cost, whether that cost was unusually low, or unusually high, unless it is accepted that deductions should be made for bad luck, ignorance, or dishonesty. Mr. Coombs.

If it is a fact that, owing to working conditions, weather, accidents, high wages, and relatively expensive material, a certain work cost the railroad an amount greatly in excess of its probable cost under average conditions and efficient management, should the actual cost be accepted as its value new?

If the necessity of maintaining service compels expensive construction, should the excess cost over that of average conditions remain a part of the cost of the work, and would that cost be accepted as the value new?

If the improved methods of construction now available would decrease the cost of new work below the amount actually expended, should such methods be used in estimating the value new?

If the original contour and the topographical conditions along the line are assumed to be restored in the cost of reproduction new, a fair estimate, in some cases at least, would require us to assume the surrounding country restored and to make some allowance for working under such conditions.

Until those discussing this matter agree on the foregoing points, there will naturally be no agreement on further extensions of the subject.

That the actual cost would be difficult to determine does not appeal to the writer as a logical reason for discarding it altogether. In many cases the cost of reproduction new might be used as a "side light" on the actual cost.

It must be admitted, however, that the actual book records are not absolute cost records. In fact, the writer does not believe that the accounts of any railroad, and of but few contractors, would show the complete expenditures for a given construction.

Referring to the acceptance of one basic principle or another, and to the deduction or inclusion of depreciation, depending on the purpose of the valuation, it would appear:

First.—That if the directors have set aside a depreciation fund, that fund plus the physical property represents accurately the full physical value of the property, and may be properly used as the physical value for any purpose.

Second.—If such a fund has not been established, the physical value is represented by the actual physical property, and is less than 100% of its book value.

Third.—As the present stockholders are not necessarily the original stockholders, some of them, under the last assumption, are innocent purchasers of stock which does not represent full value, in so far as the physical property is concerned.

Mr. Coombs.

Fourth.—The physical valuation of a railroad is its valuation as a railroad in its present location, and, from an engineering standpoint, the value should be the same either for sale, taxation, or rate-making.

Fifth.—If taxes are too high or too low, change the percentage; if freight rates are too high or too low, change the rates.

Mr. Ingersoll.

Colin M. Ingersoll, M. Am. Soc. C. E. (by letter).—To railroad engineers who have advanced in their profession, and have been through the construction period from beginning to end, this paper will most certainly appeal, for it describes in detail the very steps taken in building a railroad.

As yet, the physical valuation of railroads is in its infancy, and no definite method has been determined for making such valuation; but Mr. Wilgus has done a great service to the Profession in publishing his paper, and this will be proven when the final method of valuation is determined by the Government.

The method to be used in arriving at the valuation depends somewhat on what use is to be made of it. If it is for a quick transfer by sale, it would seem that the property should be turned over on a reproduction value, less depreciation; but if the property is kept up in a substantial manner, it would seem to the writer that the cost of reproduction new is the method which comes nearest of any that has yet been advanced to putting all roads on the same footing. The original-cost-to-date method of valuing would not seem to the writer to be fair for all, for until very recently the railroad companies were rather slack in keeping accurate costs of work. Take a railroad built in the Sixties or Seventies, the books of which have been kept up (and the writer doubts if there are very many such roads); the books would show the money that had been put into the railroad, but without any allowance for the enhanced value of the property. Perhaps the road adjoining has kept no books, and, consequently, in order to arrive at the present value, some method of reproductive value must be used.

In the first instance one cannot, by any arbitrary rule, arrive at the present-day values unless one gets at the cost of reproduction; and if this is done, the original cost is of use as a side light. Then, again, rarely in "original costs" are the whole costs shown. In construction work contractors have often received extra compensation, either by agreement or through legal process, which does not appear in the book cost of the work. Book costs show the cost of the property, but rarely include all the costs, such as engineering, legal fees, commissioners' fees, interest on money during construction, and operating losses, which really are a part of the cost of the property. In many instances land has been given and contributions have been made, for establishing stations, side-tracks, etc., in order to induce the company to build. It would seem to the writer as if they were just as much a part of the road that should be allowed to earn interest as that which was paid for. It is taxed, and can be sold and credited to the company. In many instances the purchase price of land is more than the value of the adjoining land, and rightly so. Those who have had to do with the purchasing of right of way know that one cannot go diagonally through a piece of farm land, say 5 acres, take out 2 acres, and leave the remainder of the same value per acre. For that very reason an extra price has to be paid, whether it is called an increment, damages, or an inducement to sell. It is there, and is a part of the cost of the property.

Mr. Ingersoll.

If for any reason the records of the purchase of this piece were destroyed, it would not seem to be fair that it should be valued on the basis of the value of the adjoining property. It is true that railroads can condemn, but, with small pieces of land, it is generally cheaper to purchase at a higher price than to go through condemnation proceedings, pay for commissions, lawyers, engineers, and witnesses, which, if the property is not expensive, amounts to a big percentage of the cost. Take the same case of 5 acres of land, at, say, $10 per acre. The owner for some reason, often for gain, refuses to sell. Has it been the experience of any one who has purchased land for right of way that the railroad company can get the 2 acres of land needed for $20 by condemnation? No; the lawyer, the commission, the witnesses, the engineering, etc., would cost more than twice that amount, and some method must be found to include these legitimate expenses in the value of the land. Otherwise, the railroads will have to put in capital on which no return in the way of dividends can be paid. This certainly would not seem to be fair to the investor.

The writer believes that it is proper to charge property with its share of the engineering and legal expenses, and contingencies, for the very good reasons set forth by Mr. Wilgus.

For rate-making purposes it is not believed that depreciation should be deducted from cost of reproduction. Depreciation is an element of operating costs and an obligation of the stockholders.

If a railroad has been allowed to run down while dividends have been paid, then the stockholders should forego dividends, and the earnings should be put into the property until it is brought up to standard.

Mr. Waitt.

Arthur M. Waitt, Esq. (by letter).—The writer has read this able paper with great interest, as it is based on large practical experience, and deals in a broad and comprehensive manner with a subject which is of vital importance both to the railroads and the general public.

Mr. Waitt. Probably few, if any, men have given deeper or more conscientious thought to the subject, or have had such an extensive practical experience to enable them to deal with the matter as fairly and comprehensively, as Mr. Wilgus.

It is the writer's firm conviction that in determining the physical value of railroad properties for purposes of rate-making, in justice and equity, only one basis can be used, namely, that which considers the actual capital required to reproduce the conditions and facilities found necessary by the railroads to produce their revenue, and he fully agrees with Mr. Wilgus that for rate-making purposes depreciation should not be deducted.

An intimate relation with the shop equipment and rolling stock of both American and European railroads for a long period has caused the writer to study especially the treatment of these important elements in the total valuation of railroad properties.

Oftentimes, in his practical experience, the question has arisen as to whether comparisons of the values of equipment and rolling stock taken at different periods, several years apart, would show an appreciation or a depreciation. In every instance, a careful analysis of the facts and figures, ignoring new equipment charged to the "improvement" or "capital" accounts, has shown no net appreciation in values, due to the fact that new tools and rolling stock purchased to replace old ones were invariably heavier and more valuable than the worn out or obsolete equipment. It would be true only in a few exceptional cases that, in valuations made 5 years apart, there would be an actual depreciation in total values of unincreased equipment.

If physical depreciation were deducted from cost to reproduce new, figures would be obtained which would not fairly represent the capital involved to provide the facilities and operating conditions on the railroads, for which adequate rates for transportation should be allowed.

A fair valuation of equipment or rolling stock, or, in fact, of any of the elements composing the railroad's total value, cannot be made, except by a reasonable personal examination by qualified experts in the different fields, and it cannot be done equitably by arbitrary or set rules applied regardless of local conditions.

In a valuation of the equipment or rolling stock of a railroad to determine its purchasable value at any given time, different principles would apply, and in such cases the cost of reproduction new, less existing depreciation, would be the correct measure of value. In a valuation for this purpose, no set prices and rules, applicable to all cases, can be established; the prices and percentages must be established after an examination of a sufficient portion of each class of equipment to enable an expert to determine the comparative initial values and the quality or standard of maintenance, this latter to be used in the case of each class of equipment or rolling stock.

It would be manifestly unfair to value by the same standards and figures the property of two railroads, one of which constantly purchases new locomotives, cars, machinery, and tools of the highest grade, having all the best features for obtaining high efficiency in service and longevity of equipment, and on which, by the wise expenditure of money, the equipment is maintained in the best condition for service, while the other road purchases cheap equipment and expends as little as possible in maintenance. Situations approaching each of these cases will be found, and the writer maintains that they can only be handled equitably by qualified expert judgment after personal inspection. Mr. Waitt.

No more important facts can be urged for consideration and correspondingly wise action than those which are made prominent in Mr. Wilgus' paper, but in closing the writer wishes again to emphasize two of them which, to his mind, are the most important, namely:

1.—The cost of reproduction new without depreciation should be taken as the only fair and true measure of the physical valuation of railroads for purposes of rate regulation.

2.—Expert skill and experience must be enlisted in order to make a proper estimate of the true value of railroad properties.

Stevenson Taylor, Esq. (by letter).—The general principles involved in covering methods of determining valuations of railroads, with the attendant matters of bookkeeping, establishment of costs, and the important subject of depreciation, have been considered by the author with admirable thoroughness, and the writer has no good reason for differing from his conclusions. Mr. Taylor.

If we hope to encourage "men fitted by experience, acquaintanceship, resourcefulness, courage, and tact," as well as investors large and small, so that the building, extension, and upkeep of railroads may proceed further to advance the interests of the whole country, we must deal justly with this broad question of public utility and with those who are and who may become directly interested therein.

The author has pointed the way. There may be differences as to minor details, but his paper covers the subject in a masterly manner and with fairness and justice to all concerned, including the general public.

F. C. Hand, M. Am. Soc. C. E. (by letter).—The valuation of the railroad properties of this country under the recent Act of Congress is indeed a Herculean task, probably the greatest that has ever been undertaken by our Government. The results of this work will be far-reaching, in whatever light they may be considered, whether for purposes of taxation, rate-making, ultimate Government ownership, or for the purpose of regulating stock and bond issues, as is now the case in Texas. Mr. Hand.

Mr. Hand.

The writer, however, cannot agree with the author that the ultimate valuation shall depend on the purpose for which it is to be used. There can be but one measure of actual value, as the Courts have said that the value of a property depends on the use to which it is put, and railroad property can certainly only be used for railroad purposes. If a valuation is placed on the property for rate-making purposes, where is the injustice in requiring taxes to be paid on the same valuation? Taxes are only one item of expense in the operation and maintenance of a railroad, and are taken into the accounts as such and are considered in fixing rates.

The sale-value method would hardly seem to be worth considering in this connection, as so many questions of franchises, connections, traffic facilities, outstanding obligations, and many purely intangible elements of value, that might and usually do have weight with the purchaser, would enter into the transaction as probably to modify the actual physical value very materially.

Should the Government ever acquire the roads, the owners would insist on being paid the value to them at the time of purchase, and would probably also insist on capitalization value in most cases. In that event, the valuation to be made by the Interstate Commerce Commission would be most valuable, as the relations between actual values and capitalization will be clearly defined in every instance.

The Act of Congress provides that Original Cost to Date shall be determined as one of the alternative plans, and, as Mr. Wilgus truly says, this will be a difficult undertaking. Simply because it is difficult does not by any means make it impossible. It is probably true that many of the old records are very incomplete, and also that many of them are missing, but all engineers know that in almost any appraisement there are some missing and incomplete records, and that it is necessary to go back to the period of construction for cost data, and that the greatest care is also necessary to estimate properly all conditions existent at the time when the work was actually done. This will be at times extremely difficult, but with care it should not be impossible.

The writer remembers a case in point: Some years ago a line of railroad was built across a marsh for about 3 000 ft. There was no pile-driver available, and the line was cribbed with timbers cut from and adjoining the right of way, a very expensive operation. As soon as the track was laid a top-driver was obtained and a pile trestle was driven. A few years later the marsh was drained and the entire trestle was filled with steam shovel, and now there is no indication, except the absence of borrow-pits, which would put an experienced engineer on inquiry, to show but what the entire fill might not have been put in at the time the road was originally built. Possibly the original records in this case are available; if they are not, careful inquiry and investigation would detect the original conditions, and the original cost could be arrived at pretty accurately.

Mr. Hand.

Original Cost to Date is evidently intended by the Act to show the amount of capital actually invested in the properties, and if all the items of original cost are included the result should be very satisfactory.

The author's ideas on Cost of Reproduction New are extremely lucid, and would probably be accepted by most engineers of experience as giving a good definition of the various steps, except possibly the "educational and development stage," which is not a closed chapter when the road becomes a self-sustaining or dividend-paying proposition. This system of education and development is never completed, but the cost, of course, is a part of operating expenses.

The method of valuation by Cost of Reproduction, Less Depreciation, which is provided for by the Act, is probably the one of the three methods which will be productive of the most discussion, and the one on which the greatest variance of views will appear, except possibly on the question of estimating proper land values. This extreme variance of opinion appears to the writer to be chargeable to the effort to establish a fixed basis or standard by which depreciation shall be computed. It is of course beyond dispute that nearly all the essential parts of a railroad are constantly wearing out, and consequently depreciating, but constant repairs and renewals are being made, paid for out of operating expenses, so that a first-class railroad may at all times be said to be nearly 100% perfect, from the standpoint of efficiency. In such a case, depreciation is surely negligible, as an amortization or surplus fund is being constantly set aside to provide for renewals and also for obsolescense. This fund, by whatever name it may be called, is provided out of earnings, that is, it is being provided by the public, and its reinvestment should not be taken into capital account.

Unfortunately, not all roads have handled this matter in this manner. Some of them have paid to their stockholders, in dividends or otherwise, the money which should have been set aside, and have floated another bond issue when extensive renewals or improvements became necessary, and other roads have never been able, from one cause or another, to earn enough money to set aside anything for these purposes.

These are the actual conditions as they exist on our different roads, and the writer can see no way, except by a careful and painstaking examination of each particular case by itself, to arrive at a fair estimate of depreciation. No general formula can be adopted which will be fair in all cases.

The question of land values is also one on which there are many varying views. The author says:

> "The 'original cost' measure of land values is believed to be unfair, for two reasons: It ignores the increment that is enjoyed by all other property owners through increase in the population and prosperity of the

Mr. Hand. country; and it would lead to the inconsistency of low original values on lines unfortunate enough to have preserved their land records, and high costs on adjacent lines where the absence of records would make imperative the use of present-day values."

The writer is unable to see anything really unfair in this, as under the provisions of the Act both the Original Cost and Cost of Reproduction New are to be ascertained. No increment could be claimed under the first, as the purpose is to ascertain the original cost only; and, in case the company's records are defective, a reference to county records will generally give the desired information. In the second case, the present-day values can be readily found, although there are many different plans suggested for arriving at this. The writer believes that this too should be the subject of a careful painstaking investigation in each individual case, and that no rule can be fixed which will be at all fair to both the railroads and the public. The right of way through each tract of land should be considered as a separate unit, and the matters of severance, plottage, and other damages, should be considered as they affect each tract. No uniform percentage can be used which will reflect actual values accurately, for perfectly obvious reasons. The writer has known of many instances where rights of way were obtained through comparatively large tracts when only actual acreage values were asked. The lands were not badly cut up; cattle passes or overflow waterways gave ready passage from one side to the other, and no damages beyond the acreage value could be shown. On the adjoining tract, however, the situation might be quite different, but simply because damages were caused in one case in a sum perhaps more than equal to the value of the land, is no reason why a percentage should be added in the other.

In this paper the author has not considered the capitalization of the railroads as a factor in ascertaining values, but the writer feels constrained to add a few words on this phase of the subject, as he believes it is a very live question and one that will be brought to the attention of the Valuation Division many times before this work is complete. In fact, considerable stress was laid on this feature in many of the discussions in Congress during the pendency of this Act and in the discussion incident to the passage of the appropriation for beginning the work.

The pertinence of a discussion of this feature will be apparent in the event that, as a result of this Act, an attempt should be made to regulate the issues of stocks and bonds, or should a proposition for Government ownership be seriously considered.

There is a pretty widespread impression that there is an enormous quantity of water in railroad securities, although this is stoutly denied by the railroads and by such statistical authorities as Mr. Slason Thompson.

Mr. Thompson presents an imposing array of figures to show that the railroads of the country, taken as a whole, could hardly be reproduced for the amount of their outstanding stocks and bonds, and then he goes on and shows, from these figures, that the money invested in railroad securities is only earning a very moderate rate of interest. Mr. Hand.

This would appear to settle the question, but does it? Let us inquire as to the source of these stocks and bonds.

Many of our roads were financed and built on what a noted captain of industry characterized as the "package system".

A corporation was organized with a capital of say $1 000 000 in common stock, and $1 000 000 in bonds was immediately issued. A lot of preferred stock was also issued in some instances. These were sold to investors or to a syndicate at the best price obtainable, that is, the bonds were sold, generally below par, and a bonus of stock was given with each bond subscription. This was the "package".

The road was built from the proceeds of the bonds, the remainder of the stock being retained by the promoters. We now have a road which cost not more than $1 000 000 and even less, if less than par was realized on the bonds, but which is capitalized at $2 000 000 or more in stock and bonds. We will assume that this occurred twenty or thirty years ago. The road since that time has been ably managed, and sufficient money has been saved from earnings to keep the road in good repair, and in addition make continual improvements, such as ballasting the track, replacing wooden bridges with steel and concrete structures, buying new and heavier locomotives and modern equipment of all kinds, until now the road is actually worth the amount of its capitalization. Consequently, the stockholders insist that there is no water in the capitalization, as the road could not be duplicated for any less than the amount of its outstanding securities, even if it could be done for that, on account of present higher prices. But, whose money has made this present value? Has any one put in anything since the original construction of the road, except that which the public has paid in rates? It does not need a diagram to demonstrate that one-half at least of the capitalization is water, or is, at any rate, the profit made by the stockholders who originally put in nothing.

It will be urged that the promoters were entitled to a good profit, and that they and their successors are entitled to this increment on account of their able and efficient management, and to a certain extent this is true. The fact remains, however, that if a valuation is made having regard to the original investment, some one has made quite a lot of money at the expense of the public.

This particular state of affairs, of course, did not occur in all cases, and perhaps not even in a majority of them, but it serves to show the fallacy of the position that because the present value of the roads is

Mr. Hand. equal to their capitalization, if it is, that there is no water in such securities.

When the valuation of the Interstate Commerce Commission is complete we will have a much better idea where we stand in all these matters than we do now, and the results will undoubtedly be worth much more than their cost.

Mr. Norcross. P. H. Norcross, M. Am. Soc. C. E. (by letter).—Mr. Wilgus has presented a paper which deserves not only the approval of the Engineering Profession, but also that of the legal and commercial world. He has analyzed the fundamental principles of valuation of public utilities and presented them in such a clear-cut and concise form that he has left little opportunity for discussion. The writer feels safe in asserting that this paper will become a notable addition to that rapidly growing branch of engineering literature, "Valuation of Public Utilities".

The writer believes that "valuation" or "value" is one of the most misunderstood words in the English language. It is like a sharp-edged tool, which, when used by a skilled artisan, will perform the functions intended, but, when handled by one not competent and experienced, will become a menace and a danger.

The Matter of Value.—The work to be performed by the specially appointed Valuation Committee of the Interstate Commerce Commission, involves the determination of the value of the most important and largest branch of public utilities. A railroad is necessarily property of such a character that it has not what is generally known as "market value". It is not like a commodity which is frequently bought and sold on the market, the large number of sales thus forming a basis for determining that which is usually termed "market price". This condition does not usually exist with public utilities. The circumstances may be such that the utility being considered is not salable. Even if such a condition existed, it would not affect the question of "value".

> "First and foremost the determination of the value of a public utility is a matter of judgment, and the accuracy of the determination depends upon the integrity, fairness, technical training, and ability, character, experience, and sound good sense of the man (or men) who makes it."*

The writer agrees that the practice of estimating "Cost of Reproduction New" is a prominent factor in determining the value of property. This principle has been adopted in the commercial world as a proper method for determining value. It is most important to have a clear and comprehensive understanding of this method, otherwise a correct conclusion cannot be reached.

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* "In the Matter of Condemnation Proceedings Before a Condemnation Court," Des Moines, Iowa, *vs.* Des Moines Water Company ; Brief by Guernsey, Parker and Miller.

Mr. Norcross. The appraiser must place himself in the position of some one who is about to build a railroad, and must go through all the different processes from its conception to its completion and operation, so as to arrive at the proper value of the physical property, revenue, and other characteristics, which are all elements of value in the cost of the complete system.

One of the most important things involved in the estimate of the cost of reproduction is an inventory of the property to be reproduced, and the preparation of this inventory is naturally one of the most arduous tasks that will be undertaken by the Valuation Committee. This inventory, when completed, is the basis for estimate in the cost of reproducing the physical property, and should be made by honest, competent, intelligent, and experienced engineers.

As to the adoption of unit prices, these should be based on actual experience, covering construction work of similar nature under similar conditions, and should not be predicated on more arbitrary estimates.

What is to be ascertained is the value of the property to-day. Any attempt to estimate the cost of reproduction under conditions that existed, or might have existed, at the time the property was constructed, would most probably result in an estimate so inaccurate that it would not serve the purpose for which it was made, as it might be more or less than its present value.

As to whether depreciation should be taken into account depends entirely on the purpose for which the valuation is made. If we are seeking present value, then depreciation is material. If cost is what we are seeking, depreciation is absolutely immaterial. The very reason for taking depreciation into account to ascertain present value, however, requires that appreciation be given the same importance. The writer is aware that there are authorities who take an opposite view, but nevertheless, in his opinion, the foregoing is the correct method of determining present value.

At the present time, the work of the Valuation Committee is only in its incipiency and such a paper as Mr. Wilgus has written should be of inestimable value to the members of the Interstate Commerce Commission.

Mr. Harte. Charles Rufus Harte, M. Am. Soc. C. E. (by letter).—This paper is a masterly consideration of the subject, and though specifically applied to railroad valuation is, in fundamental principles and in much detail, equally pertinent to other cases.

The author's professional standing and experience give great weight to his conclusions, but, as is almost necessarily the case in the earlier consideration of any question of moment, there are many who, viewing the situation from other angles, will find points of difference, particu-

Mr. Harte. larly in the matter of the treatment of depreciation, this independently of the series of consistent decisions by the U. S. Supreme Court.

Primarily, although many of the elements entering into it are difficult of exact determination, a valuation is the establishment of a fact, and as such it should vary only as the personal equations of the experts employed in different determinations are reflected in the variables; its intended use should have no consideration in establishing fundamental values, although it may determine what of these values shall make up the total to be obtained.

As to the method to be followed in determining this fact of the value, the "Sale Value" as defined by the author might more properly be termed the "Scrap Value," disregarding as it does not only the complex and moot factors arising from a "going" concern, but also the obvious fact that the assemblage of the parts into a complete but "dead" system is affected only at a very considerable cost over and above the price of the constituent materials as such.

Only those who have attempted the task can fully realize the utter hopelessness, in at least many instances, of determining with accuracy the "Original Cost to Date;" nor is the result obtained under the most favorable circumstances of necessity a correct valuation. "High Finance" methods on the one hand, whereby the directors of a railroad pay to themselves, as directors of a "Construction Company," contract prices far in excess of normal, or abnormally low prices on the other hand, to say nothing of items omitted from the record, will give an "Original Cost" which was not a true value at the time of construction, and may well be much more inaccurate at a later date, while appreciation or depreciation, both of which should have full consideration, are entirely ignored. The U. S. Supreme Court, in the Minnesota Rate Case decision, simply adds one more to the consistent chain of precedents when it says:

> "It is clear that in ascertaining the present value we are not limited to the consideration of the amount of the actual investment. If that has been reckless or improvident, losses may be sustained which the community does not underwrite. As the company may not be protected in its actual investment if the value of its property be plainly less, so the making of a just return for the use of the property involves the recognition of its fair value if it be more than cost."

As to whether the reproduction cost shall be figured "New", or "Less depreciation" there can be but one answer: "Both"; for both are essential to a proper understanding of conditions. The author argues for "Reproduction new", but it would seem that in doing so he takes too much for granted. It is true, of course, that a sinking fund should amortize those wastes of substance which in practice are replaced only at considerable intervals, and after the loss has reached a critical value; and that regular maintenance should care for every change that can be met as it occurs, but these are facts to be determined, and, except as it can be shown that the decrease in physical value due to such wastes actually, in the specific case considered, has been compensated by funding provisions, and such fund is made a part of the valuation, the physical value total must reflect the depreciation.

Mr. Harte.

In the case of the coal pocket cited by the author, it will hardly be contended that, in its all but broken-down condition, the pocket has the same physical value as after the subsequent complete rebuilding —nor can there be doubt that, with a properly maintained and applied amortization fund, the total value of the railroad as a whole is the same at each time.

> "If, however, a company fails to perform this plain duty" (to make provision out of earnings for replacement of waste) "and to exact sufficient returns to keep the investment unimpaired, whether this is the result of unwarranted dividends upon over issues of securities or omission to exact proper prices for the output, the fault is its own. When, therefore, a public regulation of its prices comes under question, the true value of the property then employed for the purpose of earning a return cannot be enhanced by a consideration of the errors in management which have been committed in the past."*
>
> "It must be remembered that we are concerned with a charge of confiscation of property by the denial of a fair return for its use; and to determine the truth of the charge there is sought to be ascertained the present value of the property. The realization of the benefits of property must always depend in a large degree on the ability and sagacity of those who employ it, but the appraisement is an instrument of public service, as property, not of the skill of the users. And when particular physical items are estimated as worth so much new if in fact they be depreciated, this amount should be found and allowed for. If this is not done the physical valuation is manifestly incomplete. And it must be regarded as incomplete in this case."†

It is interesting to note that the March 1st, 1913, amendment to the "Act to Regulate Commerce" of February 4th, 1887, providing for the valuation of property of carriers subject to the act, requires the determination of all the above methods except the sale value, calling for "the original cost to date, the cost of reproduction new, the cost of reproduction less depreciation, and an analysis of the methods by which these several costs are obtained and the reason for their differences, if any".

Considering the details treated, the recognition of the initiatory and developmental expenses as legitimate elements of value will be assented to by all familiar with the facts, but detailed analysis of actual expenditures will undoubtedly be required to establish the fact on a legal basis.

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* Knoxville *vs.* Knoxville Water Co., 212 U. S. 1, 10.

† Minnesota Rate Case decision.

Mr. Harte.

The point of many contingent items, difficult to foresee in the original construction or to recognize in an appraisal, is well taken. Quicksand, covered bogs, swelling clays, shattered ledges in fragments too large to handle with ordinary equipment and too small to blast except at high cost—the list could be carried out almost indefinitely—all are predetermined only by much more careful and expensive investigation than is practicable in the majority of cases, and are still more obscure after the work. The author notes the case of rock in a cut masked by earth washing over it, but here some clew may be had to earlier conditions. In the case of drained sections, however, quicksand or bog conditions which caused exceedingly heavy expense will often be completely removed after some time by the lowering of the water-table.

In the case of fills, it would seem difficult to sustain successfully an appreciation equivalent to the cost of compacting by puddling and rolling, as such a condition of density is not essential. There is, too, room for difference of opinion as to the extent to which it is proper to include costs of cleaning out cuts after operation has begun. With traffic of any moment, such work is extremely expensive, and though there can be no question as to the propriety of considering as a part of the value of the property the fair price of every yard removed, there is good argument against the inclusion of the excess due to work under regular operation, on the ground that such necessity arises from improper first construction.

The use, in determining interest, of "consistent" progress, is at least conservative. The condition of one or two critical points where unforeseen contingencies of one sort or another have delayed operation of the system until long after everything else is in readiness, is not at all unusual; and, under the regulations of to-day, a system ready for operation may be held idle for a considerable time pending the necessary authority. A case to the point is that of the Hampden Railroad, in Massachusetts, which, ready for operation on June 1st, 1913, after an expenditure said to have been practically $4 500 000, at this writing, 6 months later, is still awaiting approval of its financing.

In the matter of land values, no one with any knowledge whatsoever of the facts can sustain the contention that a strip of land for right of way does not cost considerably more per unit of area than adjoining land purchased in normal parcels. Interference with the use of the portion cut off, where the property is divided; reduction of the remainder to undesirable or uneconomic size—these are takings of property rights in the portion left as real as if the land itself was taken and must be—and in condemnation awards invariably are—given proper compensation. No less effective in enhancing legitimate values is the advantage of the situation often taken by shrewd owners. It is true that a railroad has the right of eminent domain, but the exercise

Mr. Harte.

of this right adds to the award the cost of the proceedings, and the delay—a case in Connecticut, begun in 1908, was not settled until the spring of 1913—often involves such expense in interest on the suspended construction as to make payment of an outrageous price much less expensive than to wait for the more reasonable Court award.

In the Minnesota Rate Case, the Court, it is true, refused to allow "the so-called railway value of the property", but that this was due to faulty presentation of the case is obvious in the opinion:

> "But aside from this, it is impossible to assume, in making a judicial finding of what it would cost to acquire the property, that the company would be compelled to pay more than its fair market value."

And again:

> "The Company would certainly have no grounds of complaint if it were allowed a value for these lands equal to the fair average market value of similar land in the vicinity, without additions by the use of multipliers or other use, to cover hypothetical outlays."

These quotations clearly show the failure, on the part of the railroads concerned, to develop legally the fact that "the fair average market value of similar land in the vicinity" is the value of land in right-of-way shape, and not that of land in normal parcels.

In this connection the engineer engaged in appraisal should bear strongly in mind what is too often forgotten or overlooked, not only by laymen, but by lawyers as well: The expression, "Blind Justice" as applied to the Courts is no mere figure of speech, but is a cold, hard fact. The lower Courts have very little leeway in considering any facts in a case, other than those legally presented, "judicial notice" relieving from proof only such facts as are of common knowledge beyond any question; and the higher Courts are bound absolutely to the records of the lower Court from which came the case.

The facts, therefore, in an appraisal—and for that matter in any engineering report—should be set out so that they not only can be understood, but that they cannot be misunderstood.

It has been argued that land occupied by a railroad is not entitled to any appreciation over its first cost, on the ground that such an appreciation is due to the railroad, and that if the latter were destroyed or removed the appreciation would be lost. This, however, is a question of fact. To a growing community with insufficient transportation facilities a railroad will almost invariably bring increased general values; but, except as it creates unusual manufacturing or other commercial facilities, it will depreciate its immediate vicinity; to an older settlement, having fair service, such railway improvements as additional trackage, increased terminal facilities, and the like, rarely add to general values, and almost invariably depreciate the territory affected.

Mr. Harte. In fact, the entire question of land and all other values harks back to the proposition that an appraisal is a statement of fact, depending on many variables; given an outline of the conditions, the use of averages will give a fair approximation to the total; but that appraisal which is to stand the test of the Courts—and that is the final test—must be based on, and must show beyond question and in detail, the elements of which the total is made.

Mr. Green. F. W. Green, Assoc. Am. Soc. C. E. (by letter).—As the subject of valuation occupies such a prominent place in public thought at the present time, a full discussion by the members of this Society will be most opportune. That correct principles may be expounded eventually, and erroneous conceptions convincingly exposed, is a consummation "devoutly to be wished."

On pages 307 and 308 occurs the statement:

> "A railroad, or, in fact, any other public service corporation, does not occupy the same position, relatively to the public, or to the State, as a private citizen. A corporation has no being and no existence until created by the granting of its charter by the State, which charter defines in just what direction the corporation is to exercise its functions. A railroad corporation is thus granted rights, privileges, and immunities by the State, which are not accorded to the individual. It is a fundamental axiom of both law and economics that something cannot be obtained for nothing, and thus, in return for these grants, the railroad must give up some things to the State, which the latter cannot demand from the individual."

This reflects the popular attitude, but is it correct? It is said that the corporation originated in the days of the Roman Republic, when a vast undertaking, requiring a long period of time for its completion, necessitated the creation of "a body without decay, a mind without decline." The production of wealth flows from the application of capital and labor to the development of natural resources. Public wealth is measured by the magnitude of private wealth. The development of natural resources, therefore, must inure to the public benefit. Would our country be as well developed and as prosperous to-day if the organization of corporations had never been permitted? Could our present development have been attained by individuals or by co-partnerships?

A nation may be likened to a corporation—its life is derived from its Constitution. Does not such a nation gain "something for nothing" when it assumes its Governmental functions? But, we say, the Government, in return for what it receives, gives protection to its citizens, and therefore reciprocal benefits are enjoyed. How is it in the case of a railroad corporation? It derives its life from its charter. No sane Government would give life to a corporation unless it expected public benefits to flow therefrom. The "rights, privileges, and immunities" granted by the State to the corporation presumably refer to the right of eminent domain. Does the State confer this right from motives of prodigal generosity, or *pro bono publico?* Does the corporation, in the enjoyment of it, get something for nothing, or does it pay a handsome price for condemned right of way? Any one with experience in condemnation suits knows the answer.

Mr. Green.

Elsewhere in the discussions appear references to the acquirement of rights of way by public or private donation, and intimations that the people should now turn "Indian givers" by renouncing the acts of their forefathers. If such acquirements had been obtained by fraud, the ethics of such a procedure could hardly with justice be questioned; but, when these ancient transactions occurred, were the railway corporations the only beneficiaries? Does the construction of a railway through an undeveloped country produce any increment in land values? Was the value of the land acquired for right of way, before the construction of the railway, more than a small fraction of the increase in land values enjoyed by the owners after its construction? Therefore, was the donation of the right of way a betrayal of the rights of posterity, or a shrewd business move? If, by the construction of a railway through an undeveloped country, the corporation is the means of doubling land values, the increment accruing to the landowners being entirely providential, is society treating the corporation with equity and fairness when it says: "Thou canst take the chances of going broke, but if thy venture shall profit thee, thou shalt enjoy only the legal rate of interest"?

The writer believes in the existence of rational grounds for making the rate a function of the valuation in such utilities as gas companies, telephone companies, etc., but has the temerity, here and now, to express the opinion that the application of this theory to railway rates is utterly fatuous, and predicts that, in so far as materially altering present rate conditions is concerned, the Federal Valuation of Railways will prove to be "much ado about nothing."

It would be futile, however, even to attempt to stem the tide of public clamor for valuation. One who has had no experience in physical valuation can have no adequate conception of the obstacles encountered in such work. The writer's limited experience in this class of work has already taught him the necessity of depending on the actual engineering and accounting records, whenever they are available, rather than mere conjectures as to what the cost ought to be. For example, a certain passenger station would be appraised by probably nine out of ten experienced and expert engineers at about $75 000, original cost. An examination of the original plans and accounting data, however, reveals extraordinary foundation difficulties, the conquest of which cost nearly $20 000 more than the amount that would ordinarily be estimated. Again, a certain right of way was obtained through condemnation proceedings at a cost somewhat in excess of $100 per

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acre. This was the cost to the corporation, although the actual value of the land at that time was not more than $35 or $40 per acre. Would an appraisal which failed to take such matters into consideration do full justice to the corporation?

Again, it is argued that original cost should constitute present value for valuation purposes. Is it equitable to deny to corporations the increment which is freely conceded to others?

Referring to the proposal to deduct depreciation from cost of plant: As pointed out so ably by Mr. Humphreys, plant maintenance must be provided for out of earnings, and it would be contrary to reason to make it a charge against capital. On the other hand, the very purpose of depreciation reserves is to maintain unimpaired the capital originally invested—to keep the capital alive, as it were. As long as such reserves are provided, and original capital is not depleted, no deductions should be made from original cost of plant.

For valuation purposes, a railway should not be considered merely as a collection of various items, the value of which could be determined from an inventory. It should be treated as a living organism, so to speak. There is a vast difference, for example, between the summation of values of the constituent parts of a mule, when he is dead, as compared with his live value as a "going concern."

Mr. McCormick.

R. S. McCormick, M. Am. Soc. C. E. (by letter).—In undertaking the task of placing a valuation on railroad property, the Interstate Commerce Commission has been granted large powers, and the results of this valuation will be vital to the railway companies of the United States.

The figures furnished by the Commission will certainly be utilized for the purpose of fixing rates, or at least, in adjusting rates, and it is quite probable they will also be used in fixing the compensation to be paid in the purchase of railroad property outright by the Government.

The very able and complete manner in which Mr. Wilgus has presented this subject leaves little room for criticism by members of the Society familiar with railroad conditions. That the method of valuing by "Cost of Reproduction" is eminently fair can hardly be denied, and hence, seemingly, the only thing to discuss is the question of depreciation. Volumes have been written by a multitude of authors on this subject; the Courts have decided that "depreciation" must be considered in valuing public utilities, and, in view of the recent decision in the Minnesota Rate Case, the method of "Cost of Reproduction" with depreciation considered will probably be used in whole or in part in valuing the roads.

Just what depreciation is and how it should be applied in railroad valuation is a big question. Science teaches the indestructibility of matter, and we are all agreed that, once created, matter cannot be destroyed. We all know, however, that it can, and does, change very materially. The component parts of a railroad company's property are made up of materials and things which are in continual process of change in form. They have a certain value in one form and perhaps another value in another form, until, as time goes on, they are of no value for their original purpose, and are dispensed with, or, as we say, renewed. Between the minute they were first used and the minute they will be discarded, some change in shape, form, appearance, or general utility has been going on, but, until actually discarded, their usefulness is not impaired as affecting other items; it only takes a lower standard.

Mr. McCormick.

It is agreed by all that railroad property, by the very nature of its use, must be considered in a different light from ordinary private property. This is reasonable because of the large sums invested in such property, and because, speaking generally, it can only be used for one purpose, and for any other would be valueless, or, at least, of greatly lessened value; hence, it seems clear that its true value is made up of its value for this purpose and no other.

This value can be ascertained, in all cases, by the method so well outlined by Mr. Wilgus, namely, the Cost of Reproduction, provided intelligent men are guided by right principles so as to know when they have reproduced the property.

It is not true that making new every component part or unit of a railroad is reproducing that railroad. All will recognize this fact. Neither does the writer consider it fair treatment to such property that actual physical depreciation based on age be written off against each item or unit, when, as a whole, the item or unit, as classified, say, under the Interstate Commerce Commission Classification, is 100% efficient when joined with other items.

Therefore, a fair and equitable valuation must be based on the following principles:

(*a*). A standard should be fixed for the items under the Interstate Commerce Commission Classification, as far as these accounts cover measurable items, and all items included in these accounts should be given a marking, up to 100. This marking, however, is not to be based on the age of the item, but on its condition for the purpose for which it is utilized. The standard set as 100 should be a brief and explicit statement, applicable to each account, and in this way—from information as to condition, etc., taken in the field—the value of the item as a component part of the whole, rather than as a separate entity, can be determined. This arrangement should be followed for each mile of main track, for each 5- or 10-mile section, or otherwise, as seems most convenient. To show how this would work out: Account 4, "Grading," through Account 16, "Interlocking and Other Signal Apparatus", includes all accounts and all items covering a section of rail-

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road track. For each of these accounts, the writer would define a standard and give that standard a rating of 100. "Grading", for instance, Account 4, would have a standard equal to a first-class, workman-like piece of construction, full width in all cuttings and embankments, well-shaped slopes, etc., etc., in fact, such a standard as any competent railroad construction engineer could easily define, keeping in mind the requirement mentioned under (*b*). All measurements of quantities are then made from the profile or in the field. If the work as performed meets the requirements of the standard, values are fixed at full prices to reproduce. Compacted embankments, seeded slopes, and other betterments of age, but on which no actual money was expended, will receive no advantage over newer work, except in the matter of adjusting quantities to cover same.

Now take Account 6, "Bridges, Trestles, and Culverts": A standard, covering the classification written as guided by (*b*), will be prepared. All structures will be measured, and their value estimated or fixed by data at hand. If the structure comes up to the standard, it is valued at renewal prices with no depreciation, though it may not be a new structure. The standard fixed for this classification must have sole reference to its condition and usefulness for the purpose, and not to its age. An honest engineer can grade such structures and ascertain their actual value by this method better than in any other way, and when the standard is once fixed, the proper value can be readily determined. Again, take Account 7, "Ties," or Account 8, "Rails": There will be ties in the track, and rails, also, which are not new. Could they be reproduced to answer their present purposes by any other means than by buying new ones? If not, then the standard should specify under this account that only new ties and new rails can be marked 100. Materials of this class should be valued at renewal prices and marked 100 if up to the standard in other respects.

Again, take Accounts 37 to 42, inclusive, "Equipment": Fixing a standard, based on condition, will obviate the large errors made in valuing such property by writing off depreciation based on life. Does any one doubt the efficiency and value as property, say, of a locomotive in good repair, which has not been worked beyond its capacity and is in every respect fitted to do its work? To a railroad company, is not such a machine fully as valuable as a new engine? In many cases it is more valuable. A standard, therefore, fitted to define what condition is entitled to 100, regardless of age alone, will give an equitable value, based on cost to reproduce this article as a component part of the whole. Every other account can be treated in the same way.

(*b*). In establishing the standard, locality or district should govern; that is to say, the same standard must not be applied to all sections of the country. The sections or zones should be first defined and a standard established for each.

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(*c*). Land values should be standardized over each section or district, "Right of Way and Station Grounds," Account 2, and "Real Estate," Account 3, being separated. For real estate, values must be given as determined by adjoining property; for right of way and station grounds, a standard rating for railroad lands, based on values known to exist in that section of the country. The market value of adjoining lands may be used to assist in determining this standard rating.

By following these principles, a true valuation can be obtained. By this method the values placed on all roads will include additions and betterments which have been charged to earnings and are not represented by bonded indebtedness; hence, all physical property will be valued at its real worth, and if these additions and betterments have been made wisely, they will be represented by actual property value; if, on the other hand, they have been made extravagantly or wastefully, they will not be represented, and will not be accounted for. In the one case property is in evidence, in the other, investment; and we are all aware as to which can be protected legally.

As for values not represented by physical property, that is, promotion costs, interest charges, law expenses, etc., which go to swell the actual cost of a railroad property: these, of course, cannot be valued like physical property, but, under the proposed plan of referring all data to standards, they can be given consideration, as follows:

All items of this nature found charged up to Classifications 43 to 48, inclusive, should be totaled with Classification 1, "Engineering," where these records are available. After the full physical valuation is made for the entire system, compare the actual determined values with this total. After obtaining a full history of the system, leave it to a commission to fix a proper sum to add to this valuation to ascertain the true total valuation. Surely engineers know there is a definite relationship between the value of a work produced and the costs noted above to produce it. To create infers the utilization of the services of a creator. Certain legitimate charges for such services must, and no doubt will, be permitted in the total valuation. To reproduce new any one of the railway systems of the United States involves incorporating into the value of the inanimate objects composing the property, the cost of joining them together to make of the whole a living, running organism, and such costs are legitimately represented under "Engineering" and items under "General Expenditures" in the classification.

On American roads, during late years, large expenditures have been made which are of great benefit to the public, but earn nothing for the roads themselves. All such additions and improvements will tend to swell the total value for rate-making purposes.

After all, however, rates can hardly be based on values defined for each individual company—at least, not through rates. The only ad-

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justment, therefore, as stated by Mr. Lavis, is a blanket one for that section, and for that reason the writer considers his plan of a standard for each section the only practicable way of settling the question of depreciation and ascertaining how such a valuation can be utilized in rate adjustments or rate-making. Through rates will always be regulated by agreement between roads in the territory, under private ownership, as done at one time by competition. The powers of the commission can hardly go farther than to fix a maximum beyond which the roads cannot go. The road best equipped physically, due to low gradients, etc., and best managed will get the business or the lion's share, as at present. The rate covering a district or section can be regulated, and this rate should be based on a fair return on the true value of the property.

Mr. Corner.

Charles Corner, M. Am. Soc. C. E. (by letter).—The writer has read with much interest Mr. Wilgus' paper, together with the discussions thereon, and notes that his conclusion seems to be almost that of the pioneers in this important subject.

The matter was originated by the late Governor Hogg, of Texas, under whom the Texas Stock and Bond Law and Railroad Commission Act were passed, and administered by the first chairman, the Hon. J. H. Reagan, in the Nineties. It will be remembered that Senator Reagan was the Father of the Interstate Commerce Commission as well.

Subsequent work on this subject, throughout the United States, has arisen from the initiative of these men, and, as Engineer of the Railway Commission of Texas, from 1893 to 1898, the writer did a great deal of work on the valuation of the Texas Lines, which, up to that time, had not been contested by the companies interested. Communications by the writer on this subject were forwarded to *Engineering News*,* and are included in the "Bibliography on Valuation of Public Utilities."†

This "Bibliography" is of the utmost interest and value, but the writer does not think the Annual Reports of the Texas Railways are included in it. Certainly the reports for the dates referred to throw the greatest light on the beginnings of the movement, the credit of which belongs so largely to Governor Hogg and the late Judge Reagan. After the Texas policy was inaugurated, the latter was in direct communication with several other Southern States, which, thereafter, adopted similar policies and views.

The writer thinks that this is a matter which should be put on record, because, at the time, their action excited the greatest discussion and opposition. Their general views have been amply justified; the position which they took at that time was that of far-seeing statesmen.

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* March 7th, 1895, and April 23d, 1896.

† *Transactions*, Am. Soc. C. E., Vol. LXXVI. p. 1280.

Mr. Wilgus.

William J. Wilgus, M. Am. Soc. C. E. (by letter).—The writer has a deep sense of obligation to those who have kindly participated in the discussion of his paper, as many of his own ideas have been clarified by the additional light that thereby has been cast on the subject. Mr. Crehore has generously credited him with an absence of desire "to complicate valuation work, and to seek out every possible pretext for making the assets, both tangible and intangible, look as big as possible"; and to this the writer feels that he may conscientiously reply that, in preparing this paper, he has had absolutely no other purpose in mind than an attempt to place his own views where they may be freely criticized by his fellow members and others, all in the interest of straight thinking.

Unlike Mr. Crehore, the writer does not believe that the *bona fide* stockholder as a class "gets something for nothing," nor that the stockholder is an "incumbrance." The fact that a small group of financiers may have abused the confidence and trust of innumerable innocent, if too confiding, investors of small means, seems in fairness to be no reason why experienced engineers should not attempt to formulate principles for guiding a valuation of property capitalized at some $20 000 000 000, for purposes that in the end may crystallize into a move for Government ownership.

Surely, Mr. Crehore would not ask that the subject shall be approached other than dispassionately in the hope that correct principles of valuation may be adduced, and that the facts as to any improper past return to the investor through interest and dividends and reinvested income, shall be then studied and a fair decision reached in the case of each road. Broad generalizations as to inordinate profits to investors in public utilities can hardly fail to do an injustice to a large proportion of the public that in good faith has invested amounts, great and small, in enterprises from which the entire public has reaped the enormous benefits referred to by Mr. Churchill and Mr. Green.

There are, no doubt, cases like those referred to by Mr. Hand where the public, through the rates, has paid an excessive return; but each instance requires detailed analysis to ascertain whether or not the annual distribution of cash in dividends and interest, plus the surplus reinvested in the property, really constitutes an inordinate reward to the investor. Many roads have been built up by putting back into the property moderate earnings that otherwise, with propriety, might have been distributed in cash to the stockholders, a praiseworthy proceeding that merits warm approval rather than condemnation.

In this connection it will be well to bear in mind that an approval of the theory that reinvested surplus and increases in land values are to be viewed as additional income to the stockholder, necessarily carries with it the proposition that such additional income is entitled to a return. This admitted, the accrued re-investments and other increases

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in value constitute a sinking fund, made up of equal annual payments compounded at the rate of interest to which the service is entitled, for the full period of accumulation. For instance, an increase in 60 years of $100 000 000 in the value of a property, due to the increments mentioned, is equivalent to $187 572 annually, compounded at 6 per cent. This annual sum, added to the average annual dividends and interest actually disbursed in a given time, will produce the figure that should be taken as the total past annual return to the owners of the property in both cash and "kind". The point that the increment, if interpreted as income in an analysis of past results, is entitled to a return, has been missed by many. A similar error has been made by those who would count the increment as an additional return to the owner, and at the same time brand it as a depreciation reserve.

Several, notably Mr. Eaton, have expressed regret that the broader social problems of the day have not been touched on in the paper. The writer has felt that the subject of the valuation of railroads should be treated concretely, with a definite end in sight—the logical method of arriving at physical values—and that the manner in which the result should be used is a separate matter for independent discussion. The treatment of the so-called unearned increment, including donations from the community and reinvested surplus out of questionably excessive earnings of earlier years, is a question on which few as yet agree, and until the views of the majority are expressed through legislation that will affect all kinds of property alike, it does not seem equitable that one class of investment should now be selected for retro-active action. The correct course would appear to lie in making an appraisal that will stand the acid test of analysis, and then from a study of the past condition of each property make such disposition of the unearned increment as will be in consonance with a similar attitude toward other classes of property.

Mr. Gillette speaks of the supplanting of the competitive theory of railroad ownership with the agency theory, under which the public utility continues to be financed by the owner, but is indirectly managed by the Government through public regulation. The writer believes that this dual and contradictory relationship can be but temporary, the next logical step being nationalization. The enforcement, by the Interstate Commerce Commission and similar bodies, of expenditures for improvements on railroads will make obligatory the raising of new money by the owners through the sale of bonds or other form of prior obligations, and this in time will materially reduce or wipe out the stockholder's equity. If this final step to Government ownership is inevitable, it would seem better for the stockholder to encourage the transfer while he still has something to sell, that is, before his equity has been legally confiscated.

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There is a widespread feeling, evidenced by the remarks of Messrs. Eaton and Hand, that there should be but one measure of value. The laws of some States fix values for taxation purposes at "scrap-value," and the results of physical valuations on that basis, as in the instance of New Jersey, have been presented by technical journals to their readers, without cautioning them that the figures represent scrap and not reproductive values. The difference between the two may be made clear by citing the illustration of the office chair that is worth the full cost of reproduction as a part of a going concern, whereas, thrown on the market, at auction, it would bring a mere fraction of its cost.

The contributors to the discussion by no means agree on the principle that should be adopted in determining physical value. Messrs. Churchill, Gandolfo, Gillette, and Hand, see the practicability of ascertaining the original costs from the books or the amount of cash actually invested, while Messrs. Coombs, Harte, Humphreys, Ingersoll, Lavis, Molitor, Thomson, and Whinery join with the writer in considering this course to be generally impracticable. An intimate acquaintance with the records of many corporations, large and small, has demonstrated to the writer that the obtaining of correct, full, original-costs-to-date is so generally impossible that the use of that method would work wide injustice. No doubt there are some instances where book costs have been carefully kept so as accurately to reflect every item of expense chargeable to capital account, including organization, legal and administration expenses, interest during construction, and freight on construction materials, as well as all additions and betterments, with their proper burden of overhead charges; but the exceptions are so numerous that the use of a substitute method would be imperative, with the result that all roads would not be treated alike.

An objection that has been raised to the alternative for original-cost-to-date, namely cost-of-reproduction, is the inclusion therein of the increment of land values. Many contend that railroads, being public utilities, should not profit by the increment which is freely conceded to private individuals and corporations of another character. The justice of this contention is not apparent, as there are no laws in force for the guidance of investors in public utilities, which differentiate on this point between the two classes of ownership, nor is such contention upheld by the tax authorities, as forcefully pointed out by Mr. Aldrich. Arguments on this phase of the topic are well expressed by Mr. Green.

That any other than the reproductive theory will produce inconsistent results will be seen in the following case, which is illustrative of a situation that is very common.

Of three railroads running near each other through the same territory, Line A was built 30 years ago and has partial records of original-cost-to-date, Line B was constructed recently, and has com-

Mr. Wilgus. plete and accurate records of cost, and Line C, built 15 years ago, has no records of cost whatever. If the original-cost-to-date principle is adopted, the recently-built Line B, having full records, will be treated equitably; but Line A will suffer through incompleteness of data and loss of the increment of value that is contained in the estimate for Line B, and for Line C, possessing no records, the estimate cannot be determined by the adopted principle, and, therefore, must be arrived at by some other method which will be inconsistent with that used for the rival lines. On the other hand, if the reproductive principle is adopted, all roads will be treated exactly alike, and the older lines will not be placed at a disadvantage in comparison with the last built road.

Many endorse the reproductive method in theory, but in practice propose modifications that destroy the principle. The estimating of the cost of land at the same price as neighboring property, sometimes termed the basic or normal price, ignores the facts set forth by Messrs. Aldrich, Harte, Howard, and Whinery, that land for railroad purposes actually costs in excess of such price, and that the exclusion of a part or all of the overhead costs leaves out of the estimate elements which are as essential to the creation of a railroad as scaffolding in the building of structures. The omission of these items of cost is not in accord with either the original-cost-to-date theory or the reproduction method. Estimating in this manner has not the merit of following clearly any theory that will stand analysis, and is contrary to the experience of those who are familiar with the keeping of book costs or the actual building of railroads.

It has been said that reproductive estimates provide for "what it will cost to buy again land that will never be bought again, to duplicate property that will never have to be duplicated, and to build up a business that will never again have to be developed." Is not this the course that necessarily has to be followed in arriving at the value of any going concern, the earning power of which may not be used as the measure of its value? The appraiser of the physical value of a factory would base his estimates on a duplication of the plant, including the present-day reproductive value of its lands, structures, and cost of delevopment. What would be necessary in a simple instance of this kind is just as necessary in the case of a railroad.

Referring particularly to the matter of lands, and using the previously quoted illustration, Line A will be found to have paid for right of way 30 years ago, say, $600 per acre, and the modern Line B will have paid for land of precisely the same character, say, $1 500 per acre, or three times the basic value of neighboring property which in large blocks sells at an average of $500 per acre. The original-cost-to-date principle will give Line A $600 for exactly the same kind of property which, in the case of Line B, will be valued at

$1 500; and Line C, having no records, will have its land valued by some differing method. The basic method will give Line A $500 for that which cost it $600 30 years ago, Line B will be credited with $500 for that which cost it $1 500, and, again, will Line C require some alien treatment. The reproductive method would give all three roads the same price for the same character of land, would work no injustice by confiscation, and would give to the two older lines the same values that are embodied in the cost of the new rival. Mr. Wilgus.

In the Minnesota Rate Case, the United States Supreme Court ruled in favor of the basic-price method, but the comments of the Court on the testimony of the chief witness on land values give hope that a new presentation of the subject will lead to a future modification in this regard. As is well stated by Mr. Harte, the railroads in the case mentioned failed to bring out "the fact that 'the fair average market value of similar land in the vicinity' is the value of land in right-of-way shape, and not that of land in normal parcels."

Many instances may be cited where railroads in recent years, under Court decrees in condemnation cases as well as by private purchase, have paid several times the amounts that would result from the use of the basic or neighboring-value method; and it is evident that the use of the method prescribed in the Minnesota Rate Case would work confiscation to many roads and entirely discourage the creation of new ones.

Mr. Crehore's proposal that all owners of property shall fix the value of their holdings as a basis for taxation and sale has its attractive side, but the benefits which he anticipates in the acquiring of lands for public utilities at minimum prices, would hardly materialize, in view of the question of severance and other damages that would still remain for settlement. That the property owner voluntarily should place a higher valuation on the part of his holdings through which he might imagine a railroad would be likely to pass, is crediting him with a degree of prophetic vision and engineering skill that is unpossessed by the average man; and the payment of excess taxes on such a product of his imagination would be to him a costly venture from which the chance of repayment would be, to say the least, exceedingly remote.

The question of how to handle depreciation has developed two widely divergent views. Messrs. Eaton, Gillette, Humphreys, Ingersoll, Lavis, Molitor, Taylor, and Waitt, and, to a limited degree, Messrs. Green, Harte, and Whinery, believe with the writer that no deduction therefor should be made from the cost of reproduction new, and Messrs. Brinkley, Coombs, Crehore, Gandolfo, Nicolaysen, and Willoughby think otherwise.

It is possible that this difference of opinion is to a large extent due to a failure by each side to grasp the reasons that are guiding

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Depreciation of railroad property, as generally understood, consists of physical retrogression, due to usage and decay, and to lessened effectiveness through obsolescence and inadequacy.

This physical retrogression calls for two classes of expenditures, namely: (1) current maintenance applied to those items which need constant attention in the ordinary upkeep of road and equipment; and (2) deferred maintenance of features that cannot be economically restored, renewed, or replaced until they reach maturity.

Sound practice, enforced by the rules of National and State regulatory commissions, requires that expenditures for both current and deferred maintenance of public utilities shall be charged to operating expenses, and not to capital. Stated differently, depreciation is declared to be an item of expense to be defrayed from the rate, and not wastage of capital to be paid for through the issue of securities.

A well-run corporation will maintain its property so that current repairs and renewals will not be allowed to fall behind, and it will also regulate its distribution of dividends to stockholders so that the combined depreciation reserves and profit and loss surplus will be not less than the accruals of deferred maintenance. In this connection it should be added that the profit and loss surplus of a railroad company is just as much a reserve fund for offsetting depreciation as if so labeled.

A failure thus to provide for these two classes of depreciation is usually the result of over-payment of dividends, and eventually brings its own punishment through the necessity of a reduction or suspension of dividends during the period of rehabilitation. This course is obligatory, as charges for rehabilitation legally can only be made through income.

It will thus be seen that stockholders who unwisely or improperly overpay themselves in dividends, are simply creating a liability that must be repaid through a lessened later return on their investment. They are not, as Mr. Crehore states, in the position of "eating their cake and having it too," for the reason that they must restore the "cake" from their own resources; they are prohibited from doing so through capital account.

If this line of reasoning is correct, the investor is entitled to a rate sufficiently large to: (*a*), defray operating expenses, including current maintenance and taxes; (*b*), provide an allowance for deferred maintenance; and (*c*), yield a fair return on the investment unimpaired by depreciation; with the understanding, however, that if the allowance for deferred maintenance is not properly conserved, its restoration shall be effected from the investors' return which otherwise would be available for dividends. In other words, (*a*) and (*b*) are preferred obligations.

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All this brings us back to the proposition that, under the law, physical depreciation of both classes, current and deferred, is a stockholder's liability and not a wastage of capital, and, consequently, it should not be deducted from the investment in determining a question of rates.

The railroad is a very complex organism, and the question of depreciation is correspondingly involved. A more simple illustration may assist in clarifying the subject.

The owner of a ferry-boat is admittedly entitled to a rate that will produce earnings sufficient to pay operating expenses, including all repairs, renewals, and taxes, and, say, 6% on the investment. By gouging out and restoring each spot of rot or wear as it appears, and replacing each nail or bolt the moment that it commences to chafe or rust, the boat may be maintained practically new for an indefinite period; and in that event no question would be raised as to the owner's title to the full 6% return on the unimpaired investment, as there would be no depreciation. But this method of repairing, being very costly and, therefore, adverse to public interest, it is considered better practice to confine current repairs and minor renewals to those parts which may be repaired economically from day to day, and pay at regular intervals into a deferred maintenance sinking fund an amount which, with accumulations at compound interest, will produce a sum at the end of a given period with which to restore the old boat or purchase a new one. Can it be fairly said that in the latter case the return on the investment must constantly fall from 6% on the full amount when the boat is new, to zero at the date of restoration or replacement; whereas, in the former case, so much less to the public interest, the full rate should continue without abatement? If so, it would seem far better for the investor to abstain from the common carrier field, and loan his funds in a manner that will guarantee the same rate of return without confiscation of principal.

It is admitted by many that the arguments for the non-deduction of depreciation are well taken in cases where an ample reserve has been accumulated in outside investments, as in the ferry-boat example, and in cases where the property has not been enriched through improvements paid for from income; but the claim is made that in instances of physical valuation where no such outside reserve or other assets exist, and funds for off-setting depreciation have been reinvested in the improvement of the property in the shape of additions and betterments, there is a clear inequity in permitting a return to the owner on the portion of the property so reinvested. The

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answers are: First, that the impracticability of drawing lines sharply between improvements paid for through capital and others paid for from income, makes imperative the adoption of some rule that will apply uniformly to all; second, that the methods of accounting established by the Interstate Commerce Commission prohibit the practice which would become necessary of charging repairs and renewals to capital, if items originally appraised in their depreciated condition later were raised to their restored value; third, that the treatment of past additions and betterments as the equivalent of additional income to the owner removes those items from the category of depreciation reserves; and fourth, that on the owner rests the continuing duty of replacing depreciation out of the allowed rate, making good from his own share thereof any deficiencies due to over-payment of dividends or other diversions of the part of the rate intended for current and deferred maintenance.

Many are the instances which may be quoted of a reduction or suspension of dividends from the latter cause. Railroads thus situated could not increase their rates as a means of rehabilitating their properties, and have been forced to forego a full or even partial return on the investment until the necessary repairs and renewals had been effected out of what otherwise would have been distributable to the stockholders. Certainly, neither sound financing nor the accounting rules of the Interstate Commerce Commission, would sanction the capitalizing of expenditures for rehabilitation; nor would the laws of competition or the rules of regulatory commissions permit a raise of rates to accomplish the same purpose.

Not only from the standpoint of logic does it appear that in questions of rate regulation, depreciation should not be deducted from the principal, but also, as a practical matter, this course seems to be the only one to adopt. Current maintenance fluctuates during the year so that what may be a fair estimate in one month is unfair in another month. For instance, in the fall the depreciation on ties in the railroads of the United States amounts to some $60 000 000 less than a few months earlier in the year prior to the commencement of annual renewals. Costly structures, if estimated at a depreciated value, later will be found to have been rebuilt or replaced, with a corresponding large increase in value. To add these growths in value, through restoration of depreciation, to a previously determined capital sum, in effect would amount to a capitalization of items which, under the law, had been charged to expenses—a course that speaks for unsettled rates as well as a violation of accounting principles established by the Interstate Commerce Commission. Then, too, the annual revision of depreciation, unlike additions and betterments, cannot be recorded through book entries, but necessarily must be effected through a recurrent field inspection of the multitude of items that enter into the construction of railroads,—a truly monumental task. There is the further point raised by Mr. Molitor, that what is deemed to be a depreciated condition for high-class traffic may be as good as new for a less exacting service. Moreover, the adoption of depreciated values, with their shortened lives, would call for the inclusion in the rate of higher percentages of depreciation than would be necessary were the same objects estimated at their cost new, and this would practically nullify the saving to the public of using depreciated values as a basis for fixing the investor's return.

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The recent disastrous flood damage in the Middle West is a good illustration of the matter at issue. Railroad property was depreciated to the extent of many millions of dollars, all of which had to be restored out of earnings and profit and loss surplus, without an increase of capital on which rate-payers would be expected to defray the interest. Surely, it would not be equitable to impose a further burden on the stockholders by a lessened return on the depreciated investment at the very time when they are compelled to forego a part of their savings or profit in meeting their liability to restore their property to full working condition. To do so would amount to a double burden on the stockholders through a wastage of capital and reduction of earnings or surplus.

Several of the contributors to the discussion consider that no deduction should be made for the class of depreciation that is repaired through current maintenance, but that deduction should be made in cases of deferred maintenance, as in the instance of the coal pocket cited by the writer, where no sinking fund has been provided. For the reasons above given, the replacement of a structure like the coal pocket is a liability of the company, to be paid for out of earnings otherwise applicable to dividends or out of profit and loss surplus; and the avoidance of the bookkeeping detail of separately labeling a fund for each structure should not affect the principles underlying the subject.

May it not be said, therefore, that in questions affecting rates, the desirability of avoiding constant fluctuations of rates, compliance with the accounting rules established by public regulatory commissions, the avoidance of confusion and needless complications, and sound logic, all point to the correctness of the claim that the value of railroad property should be considered unimpaired by depreciation; and that on the stockholder rests the obligation of restoring depreciation, either from profit and loss surplus or "reserves", or through a lessening of the return on his investment during the period of rehabilitation.

It is true that the United States Supreme Court, in the recently decided Minnesota Rate Case, did not take this view, but may we not conclude that this was the result of an inadequate presentation

Mr. Wilgus. of the principles underlying this important question, rather than a final endorsement by the Court of the general proposition that, in matters affecting return on capital, depreciation should be deducted from the investment.

The claim has been made that if the appreciated value of right of way and real estate is allowed, a deduction for physical depreciation is entirely proper. This does not seem to be a logical contention, for the reason that the appreciation of land values, being an additional return to the investor, plainly should be credited to capital account; while depreciation is of a physical nature caused by temporary retrogression, and is a charge to expenses and not to capital account.

On the very important item of overhead charges there appears to be little difference of opinion among those discussing the paper.

Beyond question, as brought out by Mr. Gillette, the percentage for contingencies should be comparatively small if reliable data as to quantities and up-to-date costs are obtainable from the records; but where estimates are necessarily made without the benefit of such precise knowledge, and the adopted unit prices are not inflated, a sufficiently liberal allowance for contingencies should be made, precisely as would be done by the experienced engineer in preparing preliminary estimates for any project. It has always seemed to the writer that the item of contingencies should be provided for through a percentage that will be open to inspection and discussion, rather than through an arbitrary increase of unit prices where it would be more or less concealed.

Mr. Gandolfo considers that no provision should be made for the educational stage during which construction gradually draws to a close, and traffic is built up from nothing to the full volume on which the income that may be in question is earned. With an object so simple as an automobile, the dealer devotes his time gratis to educate a customer and to the repair and replacement of any defective or imperfect parts, before the transaction is closed; and the cost of labor and materials for thus breaking in the car and educating the user is contained in the price. So, too, with a railroad, must certain expenses be provided for in the estimated cost of reproduction, for breaking in the plant, and educating the forces which are to supervise the moving of the existing volume of traffic. A railroad's operating organism does not spring, Minerva-like, into being, fully equipped and trained for a complicated service; it must pass gradually from the period of active construction to the culmination in growth of the going concern; and, as Mr. Lavis points out, it is by a suitable allowance for interest charges that this going value may be measured.

In the organization of the valuation corps largely rests the success or failure of the outcome of a physical valuation. Beyond question, the qualities mentioned by Mr. Gillette are desirable, and, in most instances, essential; but the one feature which he omits, experience, would seem to be the prime need, if the results are to stand. This is particularly mentioned by Mr. Waitt and Mr. Norcross. The chiefs of field parties certainly should have the very qualities that Mr. Brinkley would not credit to them, capacity and experience for observing and recording the condition of the property. Mr. Wilgus.

As stated by Mr. Molitor, a low-grade line through a populous country has a distinct advantage over a competitive high-grade line through a sparsely settled region; but with net earnings, in which the rate at issue is a factor, eliminated as a measure of such advantage, the selection of some other yardstick of intangible values is a problem on which no light has yet been shed. The writer has purposely abstained from suggesting a measure for such intangible values as traffic productivity and operating effectiveness, because he has been unable as yet to define in his own mind just how they may be estimated, other than for comparative purposes under known local conditions.

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